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# EVANSIA

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# The Encalyptaceae (Musci) in Maine

Ronald A. Pursell[1] & Bruce Allen[2]

The Encalyptaceae, the "extinguisher mosses," are so-called because of their large, campanulate-cylindric calyptra, resembling a candle-snuffer. Curiously, the same type of calyptra is found in the unrelated, tropical genus *Schlotheimia* Bridel (Orthotrichaceae). Two genera comprise the family, *Bryobrittonia* R. S. Williams and *Encalypta* Hedwig. *Bryobrittonia*, with a single species, *B. longipes* (Mitten) D. G. Horton, is a rare circumpolar, arctic-montane moss found in North America in the mountains of northwestern Canada and Alaska (Horton 1978, 1983). *Encalypta* has 19 species (Horton 1983), 14 of which are present in North America, mostly from the northwestern part of the continent. In addition to its characteristic calyptra, the genus *Encalypta* can be recognized by its distinctive basal laminal cells that have thickened, reddish-brown transverse walls and thin, hyaline vertical walls. This later character is also encountered in the genus *Syntrichia* Bridel, but never to the extent seen in *Encalypta*. Two species are found in Maine, *E. ciliata* Hedw. and *E. procera* Bruch. These plants are principally calciphilic, found on calcareous boulders, ledges, and soil. In Maine they occur also on relictual mounds of oyster shells. Horton (1982, 1983) studied the family in detail, and Crum and Anderson (1981) give an excellent account of the three species found in eastern United States.

**Encalypta** Hedwig, Sp. Musc. Frond. 60. 1801.

Plants usually of moderate size, usually in dense clumps, erect, branched, glaucous to sordid- or brownish-green above, brown below, densely radiculose with smooth rhizoids, rhizoids of two types: large, thick, major rhizoids that give rise to small, thin, minor rhizoids. Stems mostly with a poorly differentiated central strand, propagula usually absent, filiform when present, mostly in axillary clusters, axillary hairs

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filamentous, brownish, joined at base, with a gelatinous film, to about 2 mm long. Leaves oblong-lingulate, oblong-elliptic, oblong-ovate, ovate-lanceolate, obtuse to acute, mucronate to apiculate to hyaline-awned, crispate and more or less variously twisted when dry; margins crenulate-papillose distally, entire proximally; costa subpercurrent to short-excurrent, in cross-section with a dorsal (abaxial) stereid band of 2-8 rows of cells, large ventral (adaxial) cells in 2-4 rows, ventral (adaxial) epidermal cells chlorophyllose, papillose; upper laminal cells unistratose, hexagonal, firm-walled, pluripapillose, papillae mostly c-shaped, with short branches; basal cells unistratose, much enlarged, oblong, smooth, hyaline, with horizontal walls red-brown, noticeably thicker than vertical walls. Mostly gonioautoicous; bud-like perigonia just below terminal perichaetia. Sporophytes 1/perichaetium, terminal on main stems and branches; seta elongate, usually erect, usually twisted when dry; capsule cylindric, erect, radially symmetric, stomatose; annulus undifferentiated to differentiated; peristome single or double, occasionally lacking, when double endostome segments wholly or in part adhering to exostome; operculum conic, long-rostrate. Spores ± smooth to papillose. Calyptra rostrate, campanulate-cylindric, smooth to scindulose, erose, tringed or lobed at base.

### Key to the Species of *Encalypta* in Maine

1. Plants mostly with clusters of brown, axillary, filiform propagula; perichaetial and upper leaves hyaline-awned, others muticous; stem central strand present; peristome double .... 2. *E. procera.*
1. Plants lacking propagula or propagula few and poorly developed; leaves mucronate to apiculate; stem central strand absent; peristome single .................................... 1. *E. ciliata.*

1. ***Encalypta ciliata*** Hedwig, Sp. Musc. Frond. 61. 1801. Fig. 1, a--l.

Plants to 3.5 cm long. Stem lacking a central strand; propagula lacking or few on minor rhizoids. Leaves to 5 mm long X 1.5 mm wide; oblong-elliptic to lingulate, acute, mucronate to apiculate; margins recurved in proximal half of leaf, plane distally; costa usually short-excurrent, ventral (adaxial) cells in 2-3 rows, dorsal (abaxial) stereids in

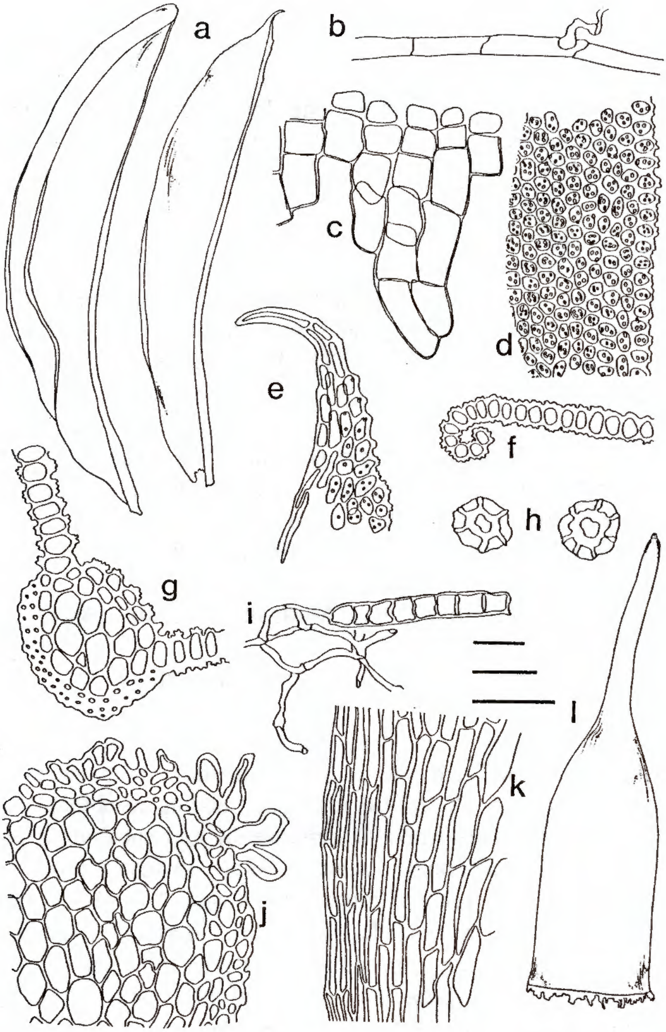

Figure 1. *Encalypta ciliata*. a. Leaves. b. Major rhizoid with minor rhizoidal branch. c. Fringe at base of calyptra. d. Upper leaf cells. e. Leaf apex. f. Leaf margin, cross-section. g. costa, cross-section. h. Spores. i. Propagula on minor rhizoid. j. Stem, cross-section. k. Basal leaf cells. l. Calyptra. Scales in mm: Upper bar = 0.5 (l); Middle bar = 0.5 (a); Middle bar = 0.05 (b-g, i-k); Lower bar = 0.05 (h). All figures drawn from *Collins s.n.* 20 July 1900 (MO).

2-3 rows; upper laminal cells 10-15 µm long X 9-13 µm wide, 3-6 papillae per cell. Seta to 10 mm. long; theca 1-3 mm long; peristome single, teeth 16, lanceolate, densely papillose; annulus undifferentiated or poorly differentiated; operculum 0.8-1.5 mm long. Spores ca. 28 µm, bipolar, wrinkled to reticulate. Calyptra 3-5 mm long, fringed at base.

On soil of hillside, rocks along bank of the Kennebec River, and base of cliffs. In Maine known from Androscoggin (*Merrill 42* MAINE, MO, NY), Aroostook (*Collins* s.n., 20 July 1900 MO, NY), Oxford (*Grout, North American Musci Perfecti 373* MO, NY; *Parlin* s.n. MAINE), Somerset (*J. A. Allen* s.n., 6-VII-1877 MO, NY), and York (*Lowe* s.n. MAINE) counties.

The smooth capsule with a single peristome, the absence of a stem central strand, and the mucronate to apiculate leaves distinguish *E. ciliata* from *E. procera*. Propagula are usually lacking in *E. ciliata*, but are produced infrequently on the minor, fine rhizoids.

2. ***Encalypta procera*** Bruch, Abh. Math.-Phys. Königl. Bayer. Akad. Wiss. 1: 283. 1832. Fig. 2, a--j.
*Encalypta streptocarpa sensu* American authors.

Plants to ca. 2 cm long. Stem with a central strand; axillary propagula in clusters, some associated with axillary tomentum of minor rhizoids. Leaves to 4.0 mm long X ca. 1.0 mm wide, oblong to oblong-elliptic, obtuse to acute, hyaline-awned in perichaetial and subtending leaves; margins plane or occasionally recurved below, incurved above; costa subpercurrent to percurrent, in cross-section with 2-3 rows of ventral (adaxial) cells and 3-5 rows of dorsal (abaxial) stereids; upper laminal cells 11-15 µm X 9-12 µm. Sporophytes not seen in Maine specimens. [Seta 11-20 mm long; theca 2-4 mm long; peristome double, teeth filiform, endostome segments ± adhering to exostome teeth in lower ½-2/3 of their length; annulus conspicuous, in 3 rows of cells, deciduous in fragments; operculum ca. 1-2 mm long. Calyptra to ca. 9 mm long, ± papillose, lacerate at base. Spores 14-26 µm, finely papillose. --[Description of sporophyte culled from Crum and Anderson 1981, and Horton 1983.]

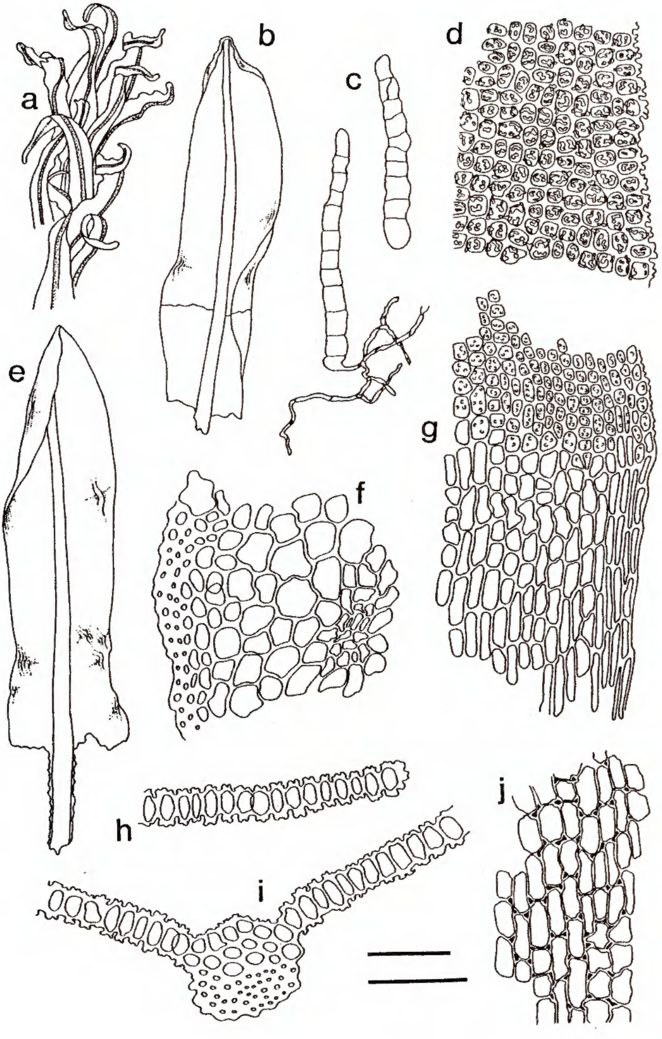

Figure 2. *Encalypta procera*. a. Habitat. b.&e. Leaves. c. Propagulae on minor rhizoids. d. Upper leaf cells. f. Stem, cross-section. g. Basal leaf cells. h. Leaf margin, cross-section. i. Costa, cross-section. j. Basal leaf cells. Scales in mm: Upper bar = 0.5 (b.&e.); Upper bar = 0.1 (c); Upper bar = 0.05 (d. f-j); Lower bar = 1. (a). All figures drawn from *Allen 6084* (MO).

A calciphile, found on lime slag heaps and relictual oyster shell mounds. In Maine known from Knox (*Allen 6084* MO) and Lincoln (*Allen 16642* MO) counties.

Perhaps the most reliable character separating *E. procera* from *E. ciliata* is the presence of a stem central strand in the former species. In *E. ciliata* the central strand is lacking. The most conspicuous vegetative character of *E. procera*, however, are the numerous clusters of axillary propagula that arise from both major and minor rhizoids. In contrast, propagula are rarely formed in *E. ciliata*, and then only on the minor rhizoids. According to most descriptions and illustrations of *E. procera*, the margins at the leaf base are narrowly recurved, but in collections from Maine the margins are proximally mostly plane and only narrowly recurved occasionally. Most leaves of *E. procera* are muticous, but the perichaetial and subtending leaves are hyaline-awned. Sporophytes are rarely produced in *E. procera*, but, when present, the peristome is double.

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_____. 1982. A revision of the Encalyptaceae (Musci), with particular reference to the North American taxa. Part. I. Journal of the Hattori Botanical Laboratory 53: 365-418.

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# Mosses of the Minnesota Valley National Wildlife Refuge in Hennepin, Dakota, and Scott Counties, Minnesota

Mariette Cole and Elizabeth Fischer[1]

The Minnesota Valley National Wildlife Refuge consists of a series of areas specifically set aside for the preservation of natural flora and fauna among the 2.2 million people living in Minneapolis, St. Paul metro area. With a growing population and an expected increase in stress on wildlife in areas within and surrounding the Twin Cities, a study of the bryophyte flora is expected to be beneficial.

Collections were made at a total of five sites along the Minnesota River, extending through three counties. Anderson Park and Bass Ponds are in Hennepin county, Black Dog is in Dakota county, and Wilkie and Louisville Swamp are in Scott county. Anderson Park, Bass Ponds, and Black Dog are within the Minneapolis, St. Paul metropolitan area, while Wilkie and Louisville Swamp are outside of the metropolitan area. All of the areas are subject to periodic flooding, with the most recent widespread flooding occurring in the spring of 1996.

A total of thirty seven species of mosses were collected. Voucher specimens are deposited in the University of Wisconsin at Stevens Point herbarium and at the Minnesota Valley National Wildlife Refuge Headquarters in Bloomington, Minnesota.

## MOSSES

### AMBLYSTEGIACEAE

*Amblystegium fluviatile* (Hedw.) BSG - Louisville Swamp: Next to stream, sandstone rock embedded in sandy soil, **EF 85**.

*A. riparium* (Hedw.) BSG - Anderson Park: River bottom forest by Nine Mile Creek, rotten log, **EF 10**; Bass Ponds: River bottom forest, rotten wood near stream, **EF 141**; Black Dog: Sandy river bank near Black Dog Lake, dry sand ten meters from river bank, **EF 26**;

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Black Dog: Aspen grove near Black Dog Lake, soil in depressed area, **EF 167**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, rotten log, **EF 89**; Wilkie: River bottom forest near Blue Lake, moist soil at lake shore, **EF 119**.

*A. serpens* (Hedw.) BSG - Anderson Park: River bottom forest by Nine Mile Creek, soft moist soil under litter, **EF 12**; Bass Ponds: River bottom forest, base of *Acer saccharinum*, **EF 139**; Black Dog: Sandy river bank near Black Dog Lake, fallen log in dry area, **EF 40**; Louisville Swamp: River bottom forest, fallen log in swampy area near lake, **EF 96**; Wilkie: River bottom forest near Blue Lake, rotten log, **EF 111**.

*A. tenax* (Hedw.) C.Jens. - Anderson Park: River bottom forest by Nine Mile Creek, rotten fallen log, **EF 14**; Black Dog: Sandy river bank near Black Dog Lake, moist sandy soil three meters from river bank, **EF 21**; Louisville Swamp: Next to stream, sandstone rock, **EF 90**; Wilkie: River bottom forest near Blue Lake, rotten log, **EF 102**.

*A. varium* (Hedw.) Lindb. - Black Dog: Sandy river bank near Black Dog Lake, dry sand 10 meters from river bank, **EF 27**; Black Dog: Aspen grove near Black Dog Lake, rotten log in depressed area, **EF 158**; Wilkie: River bottom forest near Blue Lake, sandstone rock, **EF 107**.

*Hygrohypnum luridum* (Hedw.) Jenn. - Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, sandstone rock, **EF 71**.

ANOMODONTACEAE

*Anomodon minor* (Hedw.) Furnr. - Anderson Park: River bottom forest by Nine Mile Creek, *Fraxinus pennsylvanica*, **EF 168**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, base of *Q. macrocarpa*, **EF 74**.

BARTRAMIACEAE

*Plagiopus oederiana* (Sw.) n. comb. - Black Dog: Sandy river bank near Black Dog Lake, sandy soil at base of tree, **EF 64**; Louisville Swamp: Next to stream, rotten stump, **EF 66**.

BRACHYTHECIACEAE

*Brachythecium acuminatum* (Hedw.) Aust. - Bass Ponds: Dense mixed forest, fallen log by trail, **EF 134**; Black Dog: Sandy river bank near Black Dog Lake, dry sand 10 meters from river bank, **EF 28**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, rotten log, **EF 69**.

*B. curtum* (Lind.) Limpr. - Black Dog: Fen preserve near Black Dog Lake, wet soil in depressed area, **EF 166**; Louisville Swamp: Next to stream, moist soil, **EF 68**.

*B. digastrum* CM & Kindb. *ex* Macoun & Kindb. - Bass Ponds: Dense mixed forest, soil near trail, **EF 140**; Black Dog: Sandy river bank near Black Dog Lake, sandy soil at base of tree, **EF 180**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, base of large *Q. macrocarpa*, **EF 78**.

*B. erythrorrhizon* BSG - Bass Ponds: Dense mixed forest, soil near trail, **EF 140**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, rotten log, **EF 79**.

*B. oxycladon* (Brid.) Jaeg. & Sauerb. - Bass Ponds: River bottom forest, moist soil, **EF 137**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, rotten log, **EF 84**; Wilkie: River bottom forest near Blue Lake, rock 10 meters from shore, **EF 115**.

*B. salebrosum* (Web. & Mohr) BSG - Bass Ponds: River bottom forest, rotten log embedded in soil, **EF 153**; Black Dog: Sandy river bank near Black Dog Lake, sandy soil at base of tree, **EF 181**; Black Dog: Aspen grove near Black Dog Lake, rotten logs in depressed area, **EF 160**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, rotten log, **EF 88**; Wilkie: River bottom forest near Blue Lake, rotten log, **EF 109**.

*Eurhynchium riparioides* (Hedw.) Rich. - Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, sandstone rock, **EF 71**.

*Rhynchostegium serrulatum* (Hedw.) Jaeg. and Saurb. - Black Dog: Sandy river bank near Black Dog Lake, dry sand 10 meters from river bank, **EF 22**.

BRYACEAE

*Bryum bicolor* Dicks. - Wilkie: River bottom forest near Blue Lake, sandy soil next to trail, **EF 124**.

*Leptobryum pyriforme* (Hedw.) Wils. - Black Dog: Sandy river bank near Black Dog Lake, moist soil at base of tree on the river bank, **EF 35**; Wilkie: River bottom forest near Blue Lake, sandstone rock, **EF 125**.

*Pohlia elongata* (Hedw.) - Black Dog: Sandy river bank near Black Dog Lake, moist soil at base of tree on river bank, **EF 34**; Wilkie: River bottom forest, rock 10 meters from shore, **EF 116**.

DICRANACEAE

*Dicranella heteromalla* (Hedw.) Schimp. - Black Dog: Sandy river bank near Black Dog Lake, moist soil 4 meters from river bank, **EF 182**.

DITRICHACEAE

*Ceratodon purpureus* (Hedw.) Brid. - Black Dog: Sandy river bank near Black Dog Lake, moist sandy soil on river bank, **EF 23**.

*Ditrichum rhyncostegium* Kindb. - Black Dog: Sandy river bank near Black Dog Lake, moist sandy soil, **EF 54**.

ENTODONTACEAE

*Entodon compressus* (Hedw.) C.M. - Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica,* base of large *Q. macrocarpa*, **EF 78**.

*E. seductrix* (Hedw.) C.M. - Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, granite rock, **EF 76**.

FUNARIACEAE

*Funaria hygrometrica* Hedw. - Black Dog: Sandy river bank near Black Dog Lake, moist sandy soil on river bank, **EF 24**.

*Physcomitrium collenchymatum* Gier. - Bass Ponds: River bottom forest, Sandy soil, **EF 149**.

*Physcomitrium pyriforme* (Hedw.) Hampe - Black Dog: Sandy river bank near Black Dog Lake, moist soil at base of tree on the river bank, **EF 32**; Louisville Swamp: Next to stream, sandy soil, **EF 55**;

Wilkie: River bottom forest near Blue Lake, moist sandy soil next to trail, **EF 120**.

HYPNACEAE

*Callicladium haldanianum* (Grev.) Crum - Wilkie: River bottom forest near Blue Lake, rotten logs 10 meters from shore, **EF 122**.

*Hypnum pratense* Koch *ex* Spruce - Anderson Park: River bottom forest by Nine Mile Creek, moist soil under litter, **EF 177**.

*Platygyrium repens* (Brid.) BSG - Bass Ponds: Dense mixed forest, rotten log, **EF 133**, mixed with *Callicladium haldanianum* (Grev.) Crum; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, rotten log, **EF 91**.

LESKEACEAE

*Leskea gracilescens* Hedw. - Anderson Park: River bottom forest by Nine Mile Creek, base of ash tree, **EF 16**; Bass Ponds: River bottom forest, fallen log, **EF 150**; Black Dog: River bottom forest near Black Dog Lake, base of *Salix*, **EF 19**; Black Dog: Aspen grove near Black Dog Lake, base of *Populus tremuloides*, **EF 173**; Louisville Swamp: River bottom forest, on various trees, **EF 176**; Wilkie: River bottom forest near Blue Lake, various trees, **EF 98**.

*Lindbergia brachyptera* (Mitt.) Kindb. - Black Dog: Aspen grove near Black Dog Lake, fallen *Fraxinus pennsylvanica* near aspen grove, **EF 161**.

MNIACEAE

*Mnium cuspidatum* Hedw. - Anderson Park: River bottom forest by Nine Mile Creek, side of large rotten log, **EF 6**; Bass Ponds: River bottom forest, rotten logs, **EF 131**; Black Dog: Sandy river bank near Black Dog Lake, fallen log, **EF 39**; Black Dog: Aspen grove near Black Dog Lake, sandstone rock, **EF 164**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, rotten log, **EF 83**; Wilkie: River bottom forest near Blue Lake, rock 10 meters from shore, **EF 114**.

POTTIACEAE

*Barbula unguiculata* Hedw. - Bass Ponds: River bottom forest, sandy moist soil near trail, **EF 143**; Black Dog: Sandy river bank near Black Dog Lake, moist sandy soil on river bank, **EF 36**; Black Dog: Aspen Grove near Black Dog Lake, trail near aspen grove, **EF 163**; Louisville Swamp: Next to stream, sandy soil, **EF 56**; Wilkie: River bottom forest near Blue Lake, felt-like material on trail, **EF 97**.

ORTHOTRICHACEAE

*Orthotrichum pumilum* Sw. - Black Dog: River bottom forest near Black Dog Lake, *Salix*, **EF 18**; Black Dog: Fen preserve near Black Dog Lake, fallen *Salix*, **EF 170**; Louisville Swamp: Open grown forest of *Quercus macrocarpa* and *Fraxinus pennsylvanica*, base of *Fraxinus pennsylvanica*, **EF 59**; Wilkie: River bottom forest near Blue Lake, fallen *Salix*, **EF 169**.

THUIDIACEAE

*Haplocladium microphyllum* (Hedw.) Broth. - Anderson Park: River bottom forest near Nine Mile Creek, rotten fallen log, **EF 15**; Black Dog: Sandy river bank near Black Dog Lake, fallen log, **EF 39**.

TIMMIACEAE

*Timmia megapolitana* Hedw. - Black Dog: Sandy river bank near Black Dog Lake, moist sandy soil, **EF 54**.

The authors gratefully acknowledge the assistance of Dr. Frank Bowers of the University of Wisconsin Stevens Point who verified the identity of the moss specimens, and the cooperation of Vicki Sherry of the Minnesota Valley National Wildlife Refuge.

# *Lauderlindsaya*, a parasitic fungus on *Normandina*, new to North America

Bruce McCune[1]

*Lauderlindsaya borreri* (Leighton) R. Sant. has misled many lichenologists about the taxonomic position of *Normandina pulchella*, a widespread squamulose lichen. The history of this confusion is detailed by David and Hawksworth (1989). Briefly, the perithecia of this fungus led some lichenologists to the conclusion that *Normandina* was a pyrenolichen related to *Verrucaria*, *Dermatocarpon*, or *Arthopyrenia*. In fact, no sexual reproductive structures are known for *Normandina*. David and Hawksworth (1989) give a detailed description and illustrations. Infections of *Lauderlindsaya* are readily apparent as fairly large, immersed perithecia visible as blackish dots on the otherwise greenish surface. The spores are elongate, multiseptate, and colorless.

*Lauderlindsaya borreri* was known from Australia, Europe, South America, and Asia (David & Hawksworth 1989) and is now reported from North America. It was found on mossy *Populus* trunks at a forest edge in the Cascade Mountains of southern Washington.

Examination of half a dozen other specimens of *Normandina* from North America revealed no other specimens with obvious infections. It is interesting that *Lauderlindsaya* can survive as such an extreme specialist when the host is so scattered and seldom abundant.

**Specimen:** USA: WASHINGTON: Skamania County, floodplain of Wind River near Beaver Campground, 45°50'N 121°57'W, 340 m, *McCune 23180* (OSC).

## Literature Cited

David, J. C. and D. L. Hawksworth. 1989. *Lauderlindsaya*, a new genus in the Verrucariales for *Sphaerulina chlorococca* (Leighton) R. Sant. Sydowia 41:108-121.

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# Mosses from the State of Maine - 8.

Bruce Allen[1]

Most of the records reported below were gleaned from the New York Botanical Garden herbarium. This herbarium is wealthy in historical moss collections from Maine; in part because it contains the herbaria of Helen Greenwood, Paul Patterson, Winona Welch, and Frances Wynn and in part due to the collections reported in Rand & Redfield (1894) and Hermann (1964, 1970) deposited there. But, by far the most valuable historical collection of Maine mosses in NY is that made by John Parlin and his associates. Many of Parlin's mosses were identified or verified by Robert Williams, and it is this set of Parlin's collections that is preserved in NY.

Nearly all the mosses listed below are either new or newly verified Maine county records. A few literature reports of Maine mosses have, upon re-examination, been found to be based on misdeterminations. These are noted below. There are 3 mosses in this paper that did not appear in the **Conspectus Maine Mosses** (Allen 1995): *Bryum uliginosum* (Brid.) Bruch & Schimp. in B.S.G., *Dicranum condensatum* Hedw., and *Timmia megapolitana* Hedw. At the same time 4 mosses have been provisionally deleted from the Maine moss flora: *Leucodon julaceus* (Hedw.) Sull., *Dicranum muehlenbeckii* Bruch & Schimp. in B.S.G., *Pohlia elongata* Hedw. var. *humilis* (Schimp.) Amann, and *Hygrohypnum micans*. (Hedw.) Broth. As a result, the number of mosses reported from Maine is now 391 taxa.

The nomenclature and taxonomic concepts of the species in this list follow Anderson et al. (1990) with the exception of *Sphagnum* which follows Anderson (1990).

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## AMBLYSTEGIACEAE

*Amblystegium serpens* -- **Androscoggin**: Parlin 10556 (NY); **Hancock**: Patterson 100 (NY).

*A. serpens* var. *juratzkanum* -- **Cumberland**: Wilson 4 (NY).

*A. varium* -- **Androscoggin**: Poole 12459 (NY); **Oxford**: Parlin 12660 (NY).

*Calliergon giganteum* -- **Cumberland**: Wilson (NY).

*Calliergonella cuspidata* -- **Oxford**: J.A. Allen (NY).

*Campylium chrysophyllum* -- **Hancock**: Burrage (NY).

*C. hispidulum* -- **Cumberland**: Wilson 22 (NY); **Hancock**: Morse (NY); **Oxford**: Parlin 11635 (NY).

*C. polygamum* -- **Hancock**: Patterson (NY); **Penobscot**: Adams (NY).

*C. stellatum* -- **Androscoggin**: J.A. Allen (NY); **Oxford**: J.A. Allen (NY). The report of this species from Hancock county (Salisbury Cove, Mt. Desert Island, August 6, 1929, Patterson (NY), Patterson 1930) is based on a specimen of *C. polygamum*.

*Drepanocladus uncinatus* -- **Franklin**: Levy 1082 (DUKE).

*D. vernicosa* -- **Oxford**: Stevens 988 (NY).

*Hygroamblystegium fluviatile* -- **Cumberland**: Wilson (NY); **Oxford**: Parlin 8646 (NY).

*Hygrohypnum duriusculum* -- **Hancock**: Patterson 208 (NY). All Maine records of H. molle should be referred to H. duriusculum.

*H. luridum* -- **Hancock**: Schnooberger & Wynne 233 (NY).

*H. micans*. This species was erroneously attributed to Hancock county on the basis of Rand & Redfield's (1894) reported of *Hypnum micans* Swz., a taxon equal to *Isoptyergium micans*, not *Hygrohypnum micans*.

*Leptodictyum humile* -- **Hancock**: Schnooberger & Wynne 159 (NY); **Oxford**: Parlin 11709 (NY).

*L. riparium* -- **Androscoggin**: Merrill 79 (NY); **Hancock**: Wynne 218 (NY); **Oxford**: Bacon 381 (NY).

*Platylomella lescurii* -- **Cumberland**: Wiley (NY); **Knox**: Crockett (NY); **Oxford**: Parlin & Williams 12514 (NY).

*Warnstorfia exannulata* -- **Penobscot**: Lowe (NY); **Piscataquis**: Hermann 19618 (NY).

*W. fluitans* -- **Knox**: Crockell (NY); **Oxford**: Adams 13520 (NY).

## AULACOMNIACEAE

*Aulacomnium androgynum* -- **Washington**: Collins 2571 (NY).

*A. heterostichum* -- **Lincoln**: Chamberlain 6172 (NY).

*A. palustre* -- **Piscataquis**: Hermann 19616 (NY).

*A. turgidum*. The reports of this species from Hancock county (Growing in thick-tufts on rocks in Quarry, Hall Quarry, Mt. Desert, 7--8--1926, Greenwood 58, (NY), Greenwood 1927, 1927a) are based on a collection of *Dicranum spurium*.

## BRACHYTHECIACEAE

*Brachythecium campestre* -- **Oxford**: J.A. Allen (NY); **Penobscot**: Blake 1 (NY); **Waldo**: Parlin 7227 (NY).

*B. oedipodium* -- **Androscoggin**: Merrill 5 (NY); **Hancock**: Patterson 55 (NY).

*B. oxycladon* -- **Hancock**: Morse (NY); **Oxford**: Howard [Parlin 13449] (NY).

*B. populeum* -- **Androscoggin**: Merrill 2 (NY); **Oxford**: J. A. Allen (NY); **Penobscot**: Duncan (NY).

*B. reflexum* -- **Hancock**: Patterson 316 (NY).

*B. rivulare* -- **York**: Blake 48 (NY).

*B. rutabulum* -- **Knox**: Chamberlain & Norton 5380 (NY); **Penobscot**: Duncan (NY).

*B. salebrosum* -- **Androscoggin**: Poole [Parlin 12622] (NY); **Cumberland**: Blake 62 (NY); **York**: Blake 20 (NY).

*B. velutinum* -- **Hancock**: Patterson 133 (NY).

*Bryhnia novae-angliae* -- **Hancock**: White 227 (NY); **Piscataquis**: Hermann 19309 (NY).

*Eurhynchium pulchellum* -- **Androscoggin**: Poole [Parlin 12620] (NY); **Cumberland**: Blake 33 (NY); **Oxford**: Bacon 10714 (NY); **Piscataquis**: Vreeland (NY).

*Steerecleus serratus* -- **Oxford**: Parlin 11907 (NY).

## BRYACEAE

*Bryum argenteum* -- **Hancock**: Schnooberger & Wynne 111 (NY).

*B. caespiticum* -- **Hancock**: Patterson 226 (NY); **Somerset**: O. D. Allen (NY).

*B. capillare* -- **Hancock**: White (NY).

*B. pallens* -- **Hancock**: Stebbins 673e (NY).

*B. pseudotriquetrum*-- **Waldo**: Johnson 1049 (NY).

*B. uliginosum* -- **Somerset**: O. D. Allen (NY).

*B. weigelii* -- **Franklin**: Oakes (NY).

*Leptobryum pyriforme* -- **Hancock**: White (NY).

*Pohlia cruda* -- **Hancock**: Stebbins (NY).

*P. elongata* var. *humilis*. The report of this species from Oxford county (In woodland slough, Gilbertville, 13 July 1933, Parlin 11455 (NY), Parlin 1939), is based on a specimen of *P. nutans*.

*P. obtusifolia* -- **Oxford**: Parlin 9381 (NY).

BUXBAUMIACEAE

*Buxbaumia aphylla* -- **Hancock**: Brower (NY); **Penobscot**: Pursell 11449 (MO).

*Diphyscium foliosum* -- **Piscataquis**: Hermann 19277 (NY); **York**: Gleason 3205 (NY).

CLIMACIACEAE

*Climacium americanum* -- **Cumberland**: Blake (NY); **Oxford**: Bacon (NY); **Waldo**: Johnson (NY). The report of this species from Hancock county (Somes stream, Mt. Desert Island, 30 September 1893, E.L. Rand (NY), Rand & Redfield 1894) is based on a specimen of *C. dendroides*.

*C. dendroides* -- **Cumberland**: Hutchinson (NY); **Oxford**: Dougherty (NY).

DICRANACEAE

*Dicranella palustre* -- **Oxford**: Adams 9645 (NY).

*D. varia* -- **Cumberland**: Blake 43 (NY).

*Dicranum condensatum* -- **Hancock**: Redfield (NY).

*D. elongatum*. The report of this species from Somerset county (Carry Place Township, Pierce Pond Stream Falls, Allen 9403 (MO), Allen 1991) is based on an odd expression of *D. scoparium* with erect leaves and very low costal ridges.

*D. majus* -- **Knox**: True (NY); **Sagadahoc**: Davis (NY).

*D. muhlenbeckii* -- The reports of this species from Hancock and Piscataquis counties are based on collections of *D. ontariense* (Near Copper Kettle, Acadia National Park, 12 July 1940, Schnooberger & Wynne 1539 (NY), Schnooberger & Wynne

1941,) and *D. elongatum* (Tundra Plateau, Baxter Peak Cutoff, 28 August 1964, Hermann 19594 (NY) Hermann 1970; Mt. Katahdin, 29 August 1916, Lorenz (DUKE), Peterson 1979). The species is provisionally excluded from the Maine flora.

*D. polysetum* -- **York**: Mann (NY).

*D. spurium* -- **Knox**: Chamberlain & Norton 5308 (NY); **Oxford**: J.A. Allen (NY).

*D. undulatum* -- **Waldo**: Lowe (NY).

*D. viride* -- **Oxford**: J.A. Allen (NY).

*Trematodon ambiguus* -- **Somerset**: Collins 1377 (NY).

DITRICHACEAE

*Ditrichum pusillum* -- **Piscataquis**: Hermann 19266 (NY).

FISSIDENTACEAE

*Fissidens bryoides* -- **Knox**: Crockett 133 (DUKE).

*F. bushii* -- **Androscoggin**: Parlin 11827 (NY).

*F. taxifolius* -- **Aroostook**: Pursell 11375 (MO). The report of this species from Androscoggin county (Moist earth at foot of ledge. Thorncrag, Lewiston, 3 May 1931, Parlin 11827 (NY), Parlin 1939) is based on a specimen of *F. bushii* (NY).

FONTINALACEAE

*Dichelyma capillaceum* -- **Hancock**: Rand (NY); **Waldo**: Johnson 37 (NY).

*D. falcatum* -- **Androscoggin**: Adams (NY).

*D. pallescens* -- **Androscoggin**: Parlin 13960 (NY); **Cumberland**: Blake (NY, US); **Knox**: Crockett (DUKE, NY); **Waldo**: Parlin 7281 (NY).

*Fontinalis antipyretica* -- **Oxford**: Bacon 348 (NY).

*F. antipyretica* var. *gigantea* -- **Androscoggin**: Merrill 68 (NY); **Hancock**: Redfield (NY); **Knox**: Crockett (NY); **Piscataquis**: Richards & Cooper (NY); **York**: Blake 11 (NY).

*F. dalecarlica* -- **Knox**: Crockett (NY); **Penobscot**: Merrill 64 (DUKE, NY); **Piscataquis**: Hermann 19137 (NY); **Waldo**: Norton (NY).

*F. flaccida* -- **Cumberland**: Norton (NY); **Oxford**: Norton (NY).

*F. novae-angliae* -- **Androscoggin**: Parlin 13967 (NY); **Aroostook**:

Lowe (NY); **Cumberland**: Norton (NY); **Sagadahoc**: Lowe (NY); **Waldo**: Johnson 626 (NY); **York**: Norton (NY).

*F. novae-angliae* var. *cymbifolium* -- **Hancock**: Allen 3737 (MO); **Oxford**: MacGoron 14612 (NY); **Piscataquis**: Hermann 19562 (NY); **York**: Norton (NY).

*F. sphagnifolia* -- **Androscoggin**: Blake 10 (NY); **Cumberland**: Lowe (NY); **Franklin**: Lowe (NY); **Knox**: Merrill 185 (NY); **Piscataquis**: Hermann 19316 (NY).

*F. sullivantii* -- **Hancock**: Northrop (NY).

GRIMMIACEAE

*Racomitrium affine* - **Lincoln**: Allen 1540 (MO).

*Schistidium agassizii* -- **Hancock**: Duncan (NY).

HYLOCOMIACEAE

*Rhytidiadelphus squarrosus* -- **Franklin**: Dunham (NY).

*R. triquetrus* -- **Knox**: Haring (NY); **Oxford**: J.A. Allen (NY).

*Rhytidium rugosum* -- **Hancock**: Patterson (NY); **Piscataquis**: J.A. Allen (NY).

HYPNACEAE

*Herzogiella turfacea* -- **Oxford**: J.A. Allen (NY); **York**: Blake 43 (NY).

*Homomallium adnatum* -- **Androscoggin**: Merrill 3 (NY); **Oxford**: Parlin 11901 (NY).

*Hypnum curvifolium* -- **Oxford**: Stevens 1567 (MAINE, NY).

*H. hamulosum* -- **Oxford**: Howard [Parlin 12622] (NY).

*H. imponens* -- **Aroostook**: Cummings (NY); **Oxford**: Parlin 16653 (NY).

*H. lindbergii* -- **Cumberland**: Wilson 10 (NY); **Hancock**: Rand 381 (NY).

*H. mammillatum* -- **Hancock**: Patterson 117 (NY).

*Isopterygiopsis muelleriana* -- **Franklin**: Adams (NY); **Oxford**: Parlin 12267 (NY).

*I. pulchella* -- **Somerset**: J.A. Allen (MO).

*Platydictya subtile* -- **Oxford**: J.A. Allen (NY).

*Platygyrium repens* -- **Androscoggin**: Parlin (NY).

*Pseudotaxiphyllum elegans* -- **Hancock**: Patterson 255 (NY).

*Ptilium crista-castrensis* -- **Franklin**: Levy (NY); **Knox**: Haring (NY);

**Piscataquis**: J.A. Allen (NY).

*Pylaisiella intricata* -- **Androscoggin**: Merrill 20 (NY); **Cumberland**: Chamberlain (NY); **Hancock**: Patterson 276 (NY); **Oxford**: James (NY); **York**: Blake 66 (NY).

*P. polyantha* -- **Androscoggin**: Ramsdell (NY); **Cumberland**: Blake 4 (NY).

*P. selwynii* -- **Androscoggin**: Merrill 65 (NY); **Oxford**: O.D. Allen (NY); **York**: Blake 55 (NY).

LESKEACEAE

*Leskea gracilescens* -- **Cumberland**: Chamberlain & Collins 1641 (NY); **Oxford**: Parlin14017 (NY).

*Leskeella nervosa* -- **Oxford**: Howard 12974 (NY).

LEUCODONTACEAE

*Leucodon brachypus* -- **Hancock**: Allen 2117 (MO); **Oxford**: Adams (NY).

*L. brachypus* var. *andrewsianus* -- **Cumberland**: Wilson 23 (NY); **Oxford**: J. A. Allen (NY).

*L. julaceus*. The only collection of this species reported from Maine (Madison, on tree, O.D., Allen (MO, NY), Allen 1989) actually came from Missouri. The species is provisionally excluded from the Maine flora. It has, however, been collected in Connecticut and New Hampshire and so is likely to be found in Maine.

MNIACEAE

*Plagiomnium ciliare* --**Hancock**: Wynne 221 (NY).

*P. medium* -- **Oxford**: Parlin 12175 (NY); **Penobscot**: Merrill 47 (NY).

*Pseudobryum cinclidioides* -- **Hancock**: Rand (NY).

*Rhizomnium appalachianum* -- **Cumberland**: Blake 24 (NY); **Hancock**: Rand & Redfield (NY); **Waldo**: Johnson 636 (NY).

*R. punctatum* --**Hancock**: Patterson 148 (NY); **Sagadahoc**: Friend 10504 (NY); **York**: Gleason Jr. 3184 (NY).

*R. pseudopunctatum* -- **Aroostook**: Fernald 1064 (NY).

NECKERACEAE

*Homalia trichomanoides* -- **Hancock**: Patterson 202 (NY); **Oxford**:

Dunham 510a (NY).

*Neckera pennata* -- **Penobscot**: Merrill 71 (NY); **Waldo**: Harvey (NY).

*Thamnobryum alleghaniense* -- **Oxford**: J. A. Allen (NY).

ORTHOTRICHACEAE

*Amphidium lapponicum* -- **Franklin**: Collins 1214 (NY). The reports of this species from Hancock ( Dripping rocks in woods at foot of E cliffs of Beech Cliff Mt. "Canada", 4 July 1892, E. Faxon (NY), Rand & Redfield 1894, Patterson 1930) and Oxford (Moist crevice, Peabody Ledge, Canton, 2 August 1934, Parlin 12241 (NY); Wet ledge, foot of Ragged Jack, N. Hartford, 21 June 1933, Parlin 11689 (NY), Parlin 1939) counties are based on specimens of *A. mougeotii*. (NY).

*Drummondia prorepens* -- **Cumberland**: Chamberlain 812 (NY); **Hancock**: Merrill 40 (NY); **Oxford**: Parlin 11739 (NY).

*Orthotrichum anomalum* -- **Somerset**: J.A. Allen (NY).

*O. obtusifolium* -- **Androscoggin**: Parlin 10555 (NY); **Knox**: Haring 4505 (NY).

*O. pumilum*. Patterson (1930) reported this species from Hancock county but the specimen on which the record was based (as *O. fallax*, "On willow trees, Somesville", Rand, NY) is *O. stellatum*.

*O. speciosum* -- Parlin (1939) reported this taxon from Oxford and Androscoggin counties. The specimens from Oxford county in NY, however, have poorly developed capsules making species determinations difficult. But, on the basis of plant size and aspect these collections seemed better placed in *O. sordidum*.

*O. speciosum* var. *elegans* -- **Androscoggin**: Merrill 43 (NY).

*O. strangulatum* -- **Oxford**: Parlin & Howard 11415 (NY).

*Ulota coarctata* -- **Oxford**: Parlin 12159 (NY); **York**: Blake 25 (NY).

*U. hutchinsiae* -- **Cumberland**: Blake 45 (NY); **Penobscot**: Duncan (NY); **Washington**: Duncan (NY).

PLAGIOTHECIACEAE

*Plagiothecium cavifolium* -- **Hancock**: Patterson 229 (NY).

*P. laetum* -- **Oxford**: Parlin 12357 (NY).

POLYTRICHACEAE

*Atrichum altecristatum* -- **Cumberland**: Wilson 26 (NY); **Penobscot**:

Merrill 53 (NY).
*A. crispum* -- **Knox**: Chamberlain & Norton 5362 (NY).
*A. oerstedianum* -- **Cumberland**: Blake 2 (NY); **Hancock**: Morse 57 (NY).
*Pogonatum pensilvanicum* -- **Androscoggin**: Merrill 54 (NY); **Aroostook**: Cummings (NY); **Hancock**: Northrop (NY); **Penobscot**: Blake 22 (NY).
*P. urnigerum* -- **Penobscot**: Blake 2 (NY).
*Polytrichastrum alpinum* -- **Piscataquis**: O. D. Allen (NY).
*Polytrichum commune* -- **Aroostook**: Pursell 11346 (MO).
*P. formosum* -- **Oxford** J.A. Allen (NY).
*P. pallidisetum* -- **Penobscot**: Duncan (NY).

POTTIACEAE
*Bryoerythrophyllum recurvirostre* -- **Penobscot**: Duncan (NY).
*Hymenostylium recurvirostre* -- **Piscataquis**: Porter (NY).
*Tortella tortuosa* -- **Hancock**: Patterson 158 (NY).

PTERIGYNANDRACEAE
*Myurella sibirica* -- **Hancock**: Patterson 310 (NY).

SCHISTOSTEGACEAE
*Schistostega pennata* -- **Hancock**: Johnson (NY).

SEMATOPHYLLACEAE
*Brotherella recurvans* -- **Hancock**: Patterson 344 (NY); **York**: Blake 68 (NY).

SPHAGNACEAE
*Sphagnum flavicomans* -- **Sagadahoc**: Allen 16775 (MO).
*S. palustre* -- **York**: Redfearn 33842 (MO).

TETRAPHIDACEAE
*Tetraphis geniculata* -- **Hancock**: Lorenz (NY).
*T. pellucida* -- **Cumberland**: Wilson 18 (NY); **Penobscot**: Harvey 4 (NY); **Piscataquis**: Hermann 19199 (NY).

THUIDIACEAE

*Abietinella abietina* -- **Hancock**: Patterson 290 (NY); **Oxford**: Bacon 39 (NY).

*Anomodon rostratus* -- **Oxford**: J. A. Allen (NY).

*Rauiella scita* -- **Penobscot**: Harvey 3 (NY).

*Thuidium philiberti* -- **Aroostook**: Pursell 11345a (MO); **Oxford**: J.A. Allen (NY).

*T. recognitum* -- **Knox**: Haring (NY); **Oxford**: Bacon 509 (NY); **Piscataquis**: Merrill 170 (NY).

TIMMIACEAE

*Timmia megapolitana* -- **Somerset**: J.A. Allen (NY).

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# ASC 1997 Annual Meeting:

## The collections-Based Mission of Natural History Collections

The 1997 ASC Annual Meeting will be held in Atlanta, Georgia, on April 24-26, 1997. The meeting will immediately precede the 1997 meeting of the American Association of Museums (AAM). The meeting will be held jointly for the first time with the Association of Science Museum Directors (ASMD).

The theme of the meeting, "The collections-Based Mission of Natural History Collections," is meant to focus on the core mission of institutions with natural history collections, which is to maintain those collections for use in research and the education of a broad public constituency. The connection between the collections, research derived from the collections, and public programming will be explored by several nationally-known speakers, and will be the subject of a workshop session co-sponsored by the AAM Education Committee. The workshop will serve as the initial activity of ASC's new Informal Education Committee. Anyone interested in joining the committee may attend. It is hoped that the committee will have strong liaison among AAM's Education Committee and other groups such as the Association of science and Technology Centers (ASTC).

In addition to the Theme Session and workshop, there will be two other short sessions. One will complete discussion of ASC's strategic plan, prior to a vote on the plan the ASC's business meeting. Another will bring telecommunications and database experts from OUTSIDE the systematics community to provide a better context in which to discuss database needs and progress. Each of the four sessions will last ½ day.

Information on hotels and registration forms will be available at the ASC web site, <www.ascoll.org>, or ask for information by e-mail at asc@ascoll.org.

## A Catalog and Atlas of the Mosses of Ohio

by Drs. Jerry A. Snider & Barbara K. Andreas

This reference work includes an introduction and a brief history of bryology in Ohio. A chapter on the collection and curation of bryological specimens and a map of numbers of taxa precede the lists of mosses.

Following the moss lists is an atlas of county distributions for each taxon, including a referenced index map identifying the location of each of the 88 counties. A comprehensive list of references on Ohio mosses concludes the work.

The moss catalog provides up-to-date nomenclature through 1990 for the 400 taxa (385 species and 15 varieties) of mosses recorded for Ohio. The checklist consists of two parts: an alphabetical listing of Ohio mosses arranged by family and followed by an alphabetical listing of moss taxa arranged by genus and species. Synonyms are provided under each taxon. A list of excluded taxa, including the rationale for exclusion, follows the moss lists. A separate list of synonymy concludes the moss lists.

Ohio's moss flora represents 30% of the total moss flora of North America north of Mexico, and will therefore serve as a valuable reference tool for bryologists throughout this larger geographical region.

**A Catalog and Atlas of the Mosses of Ohio** is available for sale through the office of the Ohio Biological Survey, The Ohio State University, 1315 Kinnear Road, Columbus, OH 43212-1192, USA. Phone (614) 292-9645 Fax (614) 292-7774. The price is US $15.00 plus shipping and handling charges of 10% in USA, 11% Canada, Mexico, and Central America, 15% Europe and South America, and 16% from other areas.

## Eagle Hill Field Seminars, 1997

The Humboldt Field Research Institute will again be offering summer field seminars in Maine. The 1-2 week seminars involve intensive practical field experiences, follow-up lab work and discussions, and are taught by leading national and regional authorities. The seminars are offered for an advanced and professional audience, well-qualified university and college students, and amateur naturalists. The seminars are offered at the Humboldt Field Research Institute, which is located on the coast of Maine on the summit of the peninsula just east of the Schoodic Pt. Section of Acadia National Park and just west of Petit Manan National Wildlife Refuge. Most seminars may be taken for 2 or more graduate or undergraduate credits by registering through the University of Maine.

The following seminars should be of interest to *Evansia* subscribers, but a large number of other seminars are available on zoology, earth science, ecology, entomology, and botany.

Mosses, liverworts, and *Sphagnum* Mosses, June 8-14. Norton G. Miller
Lichens and Lichen Ecology, June 15-21. David Richardson
Bryophyte Ecology, June 22-28. Nancy G. Slack
Systematic Botany, July 20-26. William A. Niering
Guild of Natural Science Illustrators Master Class, August 17-23.
    W. Scott Rawlins
Natural Plant and Lichen Dyes, August 31 - September 6.
    Karen Diadick Casselman
Fall Mushroom Foray, September 14-17 & 17-20. Richard Homola

A detailed brochure is available from the Humboldt Field Research Institute, P.O. Box 9, Steuben, ME 04680-0009. Phone (207) 546-2821. Fax (207) 546-3042. E-mail eaglhill@maine.maine.edu. Web http://maine.maine.edu/~eaglhill

## Guide to contributors to *EVANSIA*

The aim of *Evansia* is to provide a vehicle for the presentation and exchange of useful information on North American bryophytes and lichens. Articles are frequently popular in nature rather than technical and are intended to teach and inform both amateurs and professionals. The articles include, but are not restricted to, announcements of and reports on forays and meetings, presentations of techniques and aids for studying and curating lichens and bryophytes, and reports on local floras. Checklists and papers documenting new regional, state, or county records must include voucher specimens (collector and collection number) and an indication of where the specimens are deposited or a literature reference.

*Evansia* is published with the aid of desktop publishing software and manuscripts should be submitted on computer diskette. The diskette must be IBM compatible (any size) with the author's name, manuscript file name, and word processing software indicated on the disk. Most word processing files can be converted with little effort however an ASCII copy of the file using the signs described below should be sent if you are not using a standard word processor or you convert from an Apple software.

Manuscripts may also be submitted over the Internet, available through university and research computing facilities. Manuscripts and correspondence may be sent to the e-mail address listed below. The word processed document should be UUENCODED if possible. After the manuscripts have been successfully received they will be acknowledged by e-mail. Please note that if you are sending ASCII text rather than UUENCODED document, a typed, original copy of the manuscript must also be sent to the Editor. At this time only some images can be extracted from diskette, thus a good quality copy of any illustration should also be mailed.

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# South Carolina Lichens: A Preliminary Survey

Alex Ciegler[1]

The lichen population of South Carolina has not been extensively studied. Very small range maps in Hale (1979), limited to foliose and fruticose lichen distribution throughout the United States, do not adequately cover this state. The current study was designed to establish a preliminary data base for lichen occurrence and distribution in South Carolina based on physiographic regions.

Although a relatively small state, South Carolina has six physiographic regions generally designated as: 1. The Blue Ridge; 2.Southern Piedmont; 3. Carolina Sandhills; 4. Southern Coastal Plain; 5. Atlantic Coast Flatwoods; 6. Tidewater Area (Figure 1; Fairy, 1992).

1. The Blue Ridge Mountain region covers about two percent of the state's area. Elevations range from 427 to 1,036 meters; rocks are primarily metamorphosed schists and gneisses, and soils are ultisols. About 70 percent of the region is covered by oak-hickory and pine forests. Rainfall averages 152 to 193 cm per year.

2. The Southern Piedmont comprises about one-third of the state. Elevations range from 92 to 427 meters as a result of rolling hills; soils are generally clayey to loamy. Rainfall averages 114 to 152 cm per year. About two-thirds of the area is covered by mixed hardwoods and pines.

3. The Carolina Sandhills represent about 12 percent of the state's land area with elevations ranging from 76 to 137 meters. Soils are sandy, well-drained, and tend to be strongly acidic; rainfall averages 112 cm per year. About two-thirds of the region is forested with mixed hardwoods and pine.

4. The Southern Coastal Plain, an irregular area occupying about 15 percent of South Carolina, is interwoven with the Carolina landhills

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(Region 3). Elevations range from 31 to 427 meters; rainfall averages 117 cm per year. Soils are loamy to sandy-clay with extensive bottomlands that are often flooded; forests and cropland each comprise about 50 percent of the region.

5. and 6. Atlantic Coast Flatwoods and Tidewater regions cover approximately 37 percent of the state and have similar characteristics. Elevations range from 38 meters to sea level but, in general, the area is a nearly level plain dissected by many streams and rivers with broad floodplains and extensive marshlands; rainfall averages 110 to 122 cm per year. About 45 percent of the land is forested.

The climate over the entire state is temperate tending towards semitropical at the coast. Annual average temperatures in the Blue Ridge range between 2 and 18 C and on the coast between 11 and 24 C with a gradient in the intermediate regions. Relative humidity averages 54 to 59 percent in the Blue Ridge and 56 to 63 percent in the Charleston area on the southern coast. Although the above regions are sharply delineated on maps, it is obvious that they overlap in characteristics.

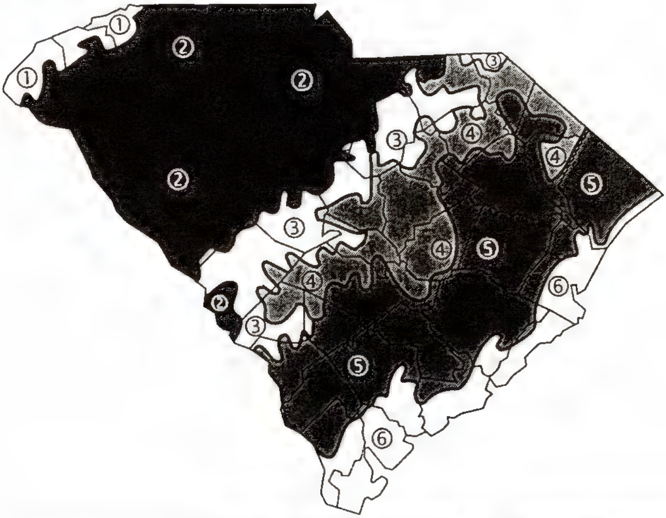

Figure 1. Physiographic regions of South Carolina: 1. Blue Ridge; 2. Southern Piedmont; 3. Carolina Sandhills; 4. Southern Coastal Plain; 5. Atlantic Coast Flatlands; 6. Tidewater Area.

Sampling was conducted primarily on public lands, i.e., state, county, and federal parks, and nature preserves. The 46 counties of South Carolina were surveyed at 132 sites (Fig. 2) and over 12,000 samples were collected over a six year period; accession numbers were assigned to each sample. Taxonomic methodology employed followed that described by Brodo (1984); nomenclature is in accordance with Esslinger and Egan (1995). Computer programs for the storage, retrieval, and manupulation of data were written in dBase III+. Although the data obtained are presented on the basis of physiographic regions, species distribution for each of the 46 counties may be retrieved from the computer data base. These data may be obtained in electronic form by request. Specimens are currently in possession of the author but will be deposited upon completion of the study at the University of South Carolina Herbarium along with all pertinent data including latitude and longitude of sampled sites.

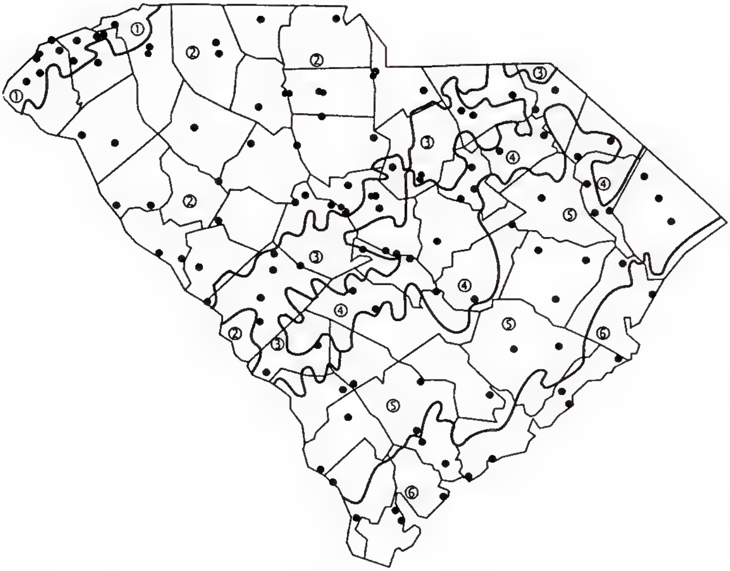

Figure 2. Lichen collecting sites in South Carolina.

Species distribution for the six physiographic regions are given in Table 1. One hundred and twenty-three genera comprising 344 species were identified over the six-year survey period. Approximately 450 specimens, particularly within the genera *Bacidia, Buellia, Cladonia, Graphis, Lecanora,* and *Parmotrema,* could not be identified to species for various reasons including aberrant and/or sterile forms and possibly specimens representing new species. Information covering these latter specimens will be reported at a later date after further study.

Table 1

Lichen Distribution by Physiographic Region

| | Physiographic Region[1] | | | | | | Range[2] |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| Acarospora citrina (Taylor) Zahlbr. | | X | X | | | | |
| Acarospora glaucocarpa (Ach.) Körber | | X | X | | | | |
| Acrocordia gemmata (Ach.) Zahlbr. | | X | | | | | |
| Ahtiana aurescens (Tuck.) Thell & Randlane | X | | | | | | |
| Allocetraria okesiana (Tuck.) Randlane & Thell | X | X | X | | | | 1 |
| Amandinea punctata (Hoffm.) Coppino & Scheid | X | X | X | X | X | X | |
| Anaptychia palmulata (Michaux) Vainio | X | X | | | | | 1 |
| Anisomeridium biforme (Borer) R.C. Harris | | | X | | | | 2 |
| Anthracothecium mucosum Zahlbr. | | X | | X | X | | 2 |
| Anthracothecium nanum (Zahlbr.) R.C. Harris | | | | | X | X | 2 |
| Anthracothecium varians R.C. Harris | | X | X | X | X | X | |
| Anzia colpodes (Ach.) Stizenb. | | X | | X | | | |
| Arthonia lapidicola (Taylor) Branth & Rostrup | | X | | | | | 2 |
| Arthonia pyrrhula Nyl. | | | | | X | | |
| Arthonia quintaria Nyl. | X | X | | X | X | X | |
| Arthonia reniformis (Pers.) Ach. | | | | | X | | 2 |
| Arthonia rubella (Fée) Nyl. | | X | | X | | X | |
| Arthopyrenia punctiformis (Pers.) Massal. | | X | X | X | X | | |
| Arthothelium interveniens (Nyl.) Zahlbr. | | | | | | X | 2 |
| Arthothelium spectabile A. Massal. | | | | | X | X | |
| Arthothelium taediosum (Nyl.) Müll. Arg. | | | | X | X | X | |
| Aspicilia cinerea (L.) Körber | X | | | | | | |
| Aspicilia contorta (Hoffm.) Kremp. | X | | | | | | |
| Aspicilia gibbosa (Ach.) Körber | | X | | | | | |
| Aspicilia laevata (Ach.) Arnold | | X | X | | | | 2 |
| Bacidia laurocerasi (Delise ex Duby) Ozenda & Clauzade | X | X | X | X | X | X | |
| Bacidia polychroa (Th.Fr.) Körber | | X | X | X | X | X | |
| Bacidia schweinitzii (Fr. ex Michener) Schneider | X | X | X | X | X | X | |
| Bacidina inundata (Fr.) Vezda | | | | | X | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bactrospora dryina (Ach.) A.Massal. | | | | | | X | |
| Biatorella sp. | X | | | | | | |
| Brigantiaea leucoxantha (Sprengel) Sant. & Hafellner | X | X | X | X | X | X | |
| Buellia caloosensis Tuck. | | X | X | X | X | X | 2 |
| Buellia curatellae Malme | X | X | X | X | X | X | 2 |
| Buellia curtisii (Tuck.) Imshaug | X | X | X | X | X | X | 2 |
| Buellia dialyta (Nyl.) Tuck. | X | X | X | X | X | X | 2 |
| Buellia imshaugiana R.C. Harris | | X | X | | X | X | 2 |
| Buellia lauricassiae (Fée) Müll. Arg. | | | | | | X | |
| Buellia mammilana (Tuck.) W.A. Webber | | X | X | | | | 2 |
| Buellia modesta (Kremp.) Müll. Arg. | | | X | X | | | 2 |
| Buellia spuria (Schaerer) Anzi | | X | X | | | | |
| Buellia stellulata (Taylor) Mudd | X | X | | | | | 2 |
| Buellia stigmaea Tuck. | X | X | X | | | | |
| Buellia stillingiana J. Steiner | X | X | X | X | X | X | 2 |
| Buellia triphragmioides Anzi | | | X | | | | |
| Buellia vernicoma (Tuck.) Tuck. | X | | X | X | | | |
| Bulbothrix confoederata (Culb.) Hale | X | | X | X | X | X | |
| Bulbothrix goebelii (Zenker) Hale | X | X | X | X | X | X | |
| Bulbothrix isidiza (Nyl.) Hale | | | X | X | X | X | 2 |
| Bulbothrix laevigatula (Nyl.) Hale | | | X | | X | | |
| Byssoloma tricholomum (Mont.) Zahlbr. | | | | | X | | |
| Calicium salicinum Pers. | | | X | | | | |
| Caloplaca camptidia (Tuck.) Zahlbr. | | X | X | X | X | | |
| Caloplaca cerina (Hedwig) Th. Fr. | | X | X | | | | |
| Caloplaca cinnabarina (Ach.) Zahlbr. | X | X | | X | | X | |
| Caloplaca citrina (Hoffm.) Th. Fr. | | X | | | | | |
| Caloplaca discolor (Willey) Fink | | X | X | | | | 2 |
| Caloplaca ferruginea (Hudson) Th. Fr. | | X | X | | X | | |
| Caloplaca flavorubescens (Hudson) J.R. Laundon | X | X | X | | X | | |
| Candelaria concolor (Dickson) Stein | X | X | X | X | X | X | |
| Candelaria fibrosa (Fr.) Müll. Arg. | X | X | | X | | | 1 |
| Candelariella vitellina (Hoffm.) Müll. Arg. | | X | | | | | |
| Candelariella efflorescens R.C. Harris & W.R. Buck | | | X | | | | |
| Canoparmelia caroliniana (Nyl.) Elix & Hale | X | X | X | X | X | X | |
| Canoparmelia crozalsiana (de Lesd. ex Harm.) Elix & Hale | | X | X | | X | | 1 |
| Canoparmelia texana (Tuck.) Elix & Hale | | X | X | | X | X | |
| Catapyrenium lacneum (Ach.) R. Sant. | | | X | | | | |
| Chrysothrix candelaris (L.) J.R. Laundon | | | X | | | | |
| Cladina arbuscula (Wallr.) Hale & Culb. | X | X | | | | | |
| Cladina evansii (Abbayes) Hale & Culb. | | | | | X | X | 1 |
| Cladina rangiferina (L.) Nyl. | X | X | X | X | | | 1 |
| Cladina subtenuis (Abbayes) Hale & Culb. | X | X | X | X | X | X | |
| Cladina subtenuis f. cinerea (Ahti) Ahti | X | X | X | X | X | | |
| Cladonia abbreviatula G.K. Merr | | | X | | | | |
| Cladonia apodocarpa Robbins | | X | X | X | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cladonia beaumontii (Tuck.) Vainio | | | X | X | | | |
| Cladonia caroliniana Tuck. | X | X | X | X | X | | |
| Cladonia cervicornis subsp.cervicornis (Ach.) Flotow | X | X | | | | | |
| Cladonia chlorophaea (Flörke ex Sommerf.) Sprengel | X | X | X | X | X | X | |
| Cladonia coniocraea (Flörke) Sprengel | X | X | X | X | X | X | |
| Cladonia cristatella Tuck. | X | X | X | X | X | | 1 |
| Cladonia cylindrica (A. Evans) A. Evans | X | X | | | | | |
| Cladonia didyma (Fée) Vainio | X | X | X | X | X | X | |
| Cladonia fimbriata (L.) Fr. | X | | | | | | |
| Cladonia floerkeana (Fr.) Flörke | X | X | X | X | X | | |
| Cladonia furcata (Hudson) Schrader | X | X | X | | X | X | |
| Cladonia incrassata Flörke | X | X | X | X | | | |
| Cladonia leporina Fr. | X | X | X | X | X | | 1 |
| Cladonia macilenta Hoffm. | | X | X | X | | | |
| Cladonia macilenta v. bacillaris (Genth) Schaerer | X | X | X | X | X | | |
| Cladonia mateocyatha Robbins | | X | X | X | X | | 1 |
| Cladonia ochrochlora Flörke | | X | | | X | X | |
| Cladonia parasitica (Hoffm.) Hoffm. | X | X | X | X | X | | 1 |
| Cladonia petrophila R.C. Harris | | | X | | | | 2 |
| Cladonia peziziformis Laundon | X | X | X | X | X | X | |
| Cladonia piedmontensis G. Merr | X | X | | X | X | | |
| Cladonia polycarpoides Nyl. | X | X | X | X | X | | |
| Cladonia pyxidata (L.) Hoffm. | X | | | | | | |
| Cladonia ramulosa (With.) J.R.Laundon | X | X | X | | X | X | |
| Cladonia rappii A. Evans | | | X | X | X | X | 1 |
| Cladonia ravenelii Tuck. | | | X | | X | | |
| Cladonia sobolescens Nyl. ex Vainio | X | X | X | X | X | X | |
| Cladonia squamosa Hoffm. | X | X | X | | | | |
| Cladonia strepsilis (Ach.) Grognot | X | | X | | | | |
| Cladonia subapodocarpa R.C. Harris | | X | | | | | |
| Cladonia subradiata (Vainio) Sandst. | | | | | X | X | |
| Cladonia subsetacea Robbins ex A. Evans | | | X | | X | | |
| Cladonia symphycarpa (Flörke) Fr. | | | | | X | | |
| Cladonia uncialis (L.) F.H. Wigg | X | X | X | | | | |
| Cliostomum griffithii (Sm.) Coppins | | X | X | X | X | | |
| Coccocarpia erythroxyli (Sprengel) Swinscow & Krog | | | X | | | | |
| Coenogonium interplexum Nyl. | | | | X | X | X | |
| Coenogonium moniliforme Tuck. | | | | | X | X | |
| Collema furfuraceum (Arnold) Du Rietz | X | X | | | X | | |
| Collema nigrescens (Hudson) DC. | | X | | X | X | | |
| Collema subflaccidum Degel. | X | X | | X | X | | |
| Cryptothecia rubrocincta | | | | | | X | |
| Dermatocarpon miniatum (L.) W.Mann | | X | | | | | |
| Dibaeis baeomyces (L.F.) Rambold & Hertel | X | X | X | X | X | | 1 |
| Dimerella lutea (Dickson) Trevisan | | X | | | | | |
| Diploschistes actinostomus (Ach.) Zahlbr. | | | X | | | | 2 |
| Diploschistes scruposus (Schreber) Norman | | | X | | | | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dirinaria aegialita (Afz.) B. Moore | | | | | X | X | |
| Dirinaria confusa D.D. Awasthi | | | X | | X | X | |
| Dirinaria frostii (Tuck.) Hale & Culb. | | X | X | | | | |
| Dirinaria picta (Sw.) Clem. & Shear | | X | | | X | X | |
| Dirinaria purpurascens (Vainio) B. Moore | | | | | X | X | 2 |
| Flavoparmelia baltimorensis (Gyelnk & Foriss) Hale | X | X | X | X | X | | 1 |
| Flavoparmelia caperata (L.) Hale | X | X | X | X | X | X | |
| Glyphis cicatricosa Ach. | | X | X | X | X | X | |
| Graphina columbina (Tuck.) M.Wirth & Hale | | X | X | X | X | X | 2 |
| Graphina subvirginalis (Nyl.) Müll. Arg. | | | X | | | | 2 |
| Graphina xylophaga R.C. Harris | | | | | | X | 2 |
| Graphis afzelii Ach. | | | X | X | X | X | |
| Graphis anfractuosa Eschw. | | | | | | X | 2 |
| Graphis dumastioides Fink | | | | X | X | | |
| Graphis elegans (Borrer ex Sm.) Ach. | | X | X | X | X | X | |
| Graphis grammatis Fée | | | | | | X | |
| Graphis insidiosa (C.Knight & Mitten) J.D. Hook | | X | X | X | X | X | |
| Graphis intricata Fée | | X | | | | | 2 |
| Graphis lineola Ach. | | | | X | | X | 2 |
| Graphis mosquitensis Tuck. | X | X | X | X | X | X | |
| Graphis poitaeoides Nyl. | | | X | | | | 2 |
| Graphis scripta (L.) Ach. | X | X | X | X | X | X | |
| Graphis striatula (Ach.) Sprengel | | X | | X | X | | |
| Graphis tenella Ach. | | X | | | | | |
| Gymnoderme lineare (A. Evans) Yoshim. & Sharp | X | | | | | | 2 |
| Gyrostomum scyphuliferum (Ach.) Nyl. | | | X | X | X | X | |
| Haematomma puniceum (Ach.) Massal. | X | X | X | X | X | X | |
| Heterodermia albicans (Pers.) Swinscow & Krog | X | X | X | X | X | X | |
| Heterodermia casarettiana (Massal.) Trevisan | X | X | X | X | X | X | |
| Heterodermia echinata (Taylor) Culb. | X | X | | | | | |
| Heterodermia granulifera (Ach.) Culb. | | X | X | | X | | 1 |
| Heterodermia hypoleuca (Muhl.) Trevisan | X | | X | | X | | |
| Heterodermia leucomelos (L.) Poelt | X | | | | | | |
| Heterodermia obscurata (Nyl.) Trevisan | X | X | X | X | X | X | |
| Heterodermia speciosa (Wulfen) Trevisan | X | X | X | X | X | X | |
| Hyperphyscia syncolla (Tuck. ex Nyl.) Kalb | X | | | | | | |
| Hypotrachyna livida (Taylor) Hale | X | X | X | X | X | X | |
| Hypotrachyna osseoalba (Vainio) Park & Hale | | X | X | X | X | X | |
| Hypotrachyna pustulifera (Hale) Skorepa | X | X | X | X | X | X | |
| Hypotrachyna revoluta (Flörke) Hale | X | | | | | | |
| Imshaugia aleurites (Ach.) S.F. Meyer | X | X | | | | | |
| Lasallia papulosa (Ach.) Llano | X | X | | | | | |
| Lecanora albella var. rubescens (Imshaug & Brodo) Lumbsch | X | X | | X | X | X | |
| Lecanora allophana Nyl. | X | X | X | X | X | | |
| Lecanora argentata (Ach.) Malme | | X | X | X | X | | |
| Lecanora caesiorubella subsp. glaucomodes (Nyl.) Imshaug & Brodo | | X | X | | X | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Lecanora caesiorubella subsp. prolifera (Fink) R. C. Harris | X | X | X | X | X | X | |
| Lecanora cinereofusca var. appalachensis Brodo | X | X | | | | | |
| Lecanora cinereofusca var. cinereofusca H. Magnusson | | X | | | | | |
| Lecanora cupressi Tuck. | X | X | X | X | X | X | |
| Lecanora deplanans Nyl. | | X | | | | | |
| Lecanora hagenii (Ach.) Ach. | | X | X | | X | | |
| Lecanora hybocarpa (Tuck.) Brodo | | X | X | X | X | X | |
| Lecanora imshaugii Brodo | X | X | X | X | X | X | |
| Lecanora louisianae de Lesd. | | | | X | | | |
| Lecanora miculata Ach. | X | X | X | X | X | | |
| Lecanora oreinoides (Körber) Hertel & Rambold | | X | X | | X | | |
| Lecanora orosthea (Ach.) Ach. | | | X | | X | | |
| Lecanora pulicaris (Pers.) Ach. | X | X | | X | X | | |
| Lecanora saligna (Schrader) Zahlbr. | | | X | | | | |
| Lecanora sp.#2 Brodo | X | X | | X | X | X | |
| Lecanora subimmergens Vainio | X | X | | | | | |
| Lecanora varia (Hoffm.) Ach. | X | X | X | X | X | X | |
| Lecidea carneoalbens Nyl. | | | | | X | | 2 |
| Lecidea mutabilis Fée | X | X | X | X | X | X | 2 |
| Lecidea russula | | | X | | | | |
| Lecidea tessellata Flörke | | X | X | | | | |
| Leproloma membranaceum (Dickson) Vainio | X | X | X | | X | X | |
| Leptogium austroamericanum (C.W. Malme) Dodge | X | X | X | X | X | X | |
| Leptogium azureum (Sw.) Mont. | | | | | X | | 2 |
| Leptogium burnetiae C.W.Dodge | X | X | | | | | 2 |
| Leptogium corticola (Taylor) Tuck. | X | X | | | | | |
| Leptogium chloromelum (Sw. ex Ach.) Nyl. | | X | | | X | | |
| Leptogium cyanescens (Rabenh.) Körber | X | X | X | X | X | X | |
| Leptogium lichenoides (L.) Zahlbr. | | X | | | | | |
| Letrouitia domingensis (Pers.) Hafellner & Bellem. | | | | X | X | X | |
| Letrouitia vulpina (Tuck.) Hafellner & Bellem. | X | | | | X | | |
| Lithothelium hyalosporum (Nyl.) Aptroot | | X | | | | | |
| Lobaria pulmonaria (L.) Hoffm. | X | X | | | | | |
| Lobaria quercizans Michaux | | X | | | | | |
| Lobaria ravenelii (Tuck) Yoshim. | X | X | | | | | |
| Lopadium sp. | | | | | | X | |
| Loxospora cismonica (Beltr.) Hafellner | | X | | X | X | X | 2 |
| Loxospora elatina (Ach.) A. Massal. | | X | X | X | X | X | 2 |
| Maronea constans (Nyl.) Hepp. | X | X | X | X | X | X | |
| Medusulina nitida (Eschw.) Müll. Arg. | | X | X | | X | X | |
| Melanelia exasperata (DeNot.) Essl. | X | X | X | | | | 1 |
| Melanelia fuliginosa (Fr. ex Duby) Essl. | | | X | | | | |
| Melanelia halei (Ahti) Essl. | | X | | | | | |
| Micarea chlorosticta R.C. Harris | | | | | | X | |
| Mycomicrothelia subfallens (Müll. Arg.) D. Hawksw. | | X | X | | | | |
| Mycoporum compositum (Massal.) R.C. Harris | X | X | | X | | X | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Myelochroa aurulenta (Tuck.) Elix & Hale | X | X | X | X | X | X | |
| Myelochroa galbina (Ach.) Elix & Hale | X | X | X | X | X | X | 1 |
| Myelochroa obsessa (Ach.) Elix & Hale | X | X | X | | | | 1 |
| Nephroma helveticum Ach. | | X | | | | | |
| Normandina pulchella (Borrer) Nyl. | X | X | X | | | | |
| Ochrolechia africana Vainio | X | X | X | X | X | X | |
| Ochrolechia szatalaensis Vers. | X | | | | | | |
| Opegrapha astraea Tuck. | | X | | | | | |
| Opegrapha atra Pers. | | X | X | | | | |
| Opegrapha longissima Müll. Arg. | X | | | X | | | 2 |
| Opegrapha viridis (Pers. ex Ach.) Nyl. | | X | | X | | | |
| Pannaria lurida (Mont.) Nyl. | X | X | | | | | |
| Pannaria tavaresii P.M. Jorg. | X | X | | | | | |
| Parmelia saxatilis (L.) Ach. | X | X | | | | | |
| Parmelia squarrosa Hale | X | X | X | | | | 1 |
| Parmelina horrescens Hale | X | X | X | | X | | |
| Parmelinopsis horrescens (Taylor) Elix & Hale | X | X | X | X | X | X | |
| Parmelinopsis minarum (Vainio) Elix & Hale | X | X | X | X | X | X | |
| Parmeliopsis subambigua Gyelnik | | | X | X | X | X | |
| Parmotrema arnoldii (Du Rietz) Hale | | X | | | | | |
| Parmotrema austrosinense (Zahlbr.) Hale | X | X | X | X | | | 1 |
| Parmotrema chinense (Osbeck) Hale & Ahti | X | X | | | | | |
| Parmotrema crinitum (Ach.) M. Choisy | X | X | X | X | X | X | |
| Parmotrema cristiferum (Taylor) Hale | | | | | X | | 2 |
| Parmotrema dilitatum (Vainio) Hale | | X | X | X | X | X | 1 |
| Parmotrema endosulphureum (Hillm.) Hale | | X | | | | | |
| Parmotrema gardneri (C.W. Dodge) Serus | | X | X | X | X | X | |
| Parmotrema hypoleucinum (Steiner) Hale | | | | | | X | |
| Parmotrema hypotropum (Nyl.) Hale | X | X | X | X | X | X | |
| Parmotrema internexum (Nyl.) Hale | | X | X | | | | |
| Parmotrema louisianae (Hale) Hale | | | | | | X | 2 |
| Parmotrema mellissii (C.W. Dodge) Hale | X | X | X | X | X | X | |
| Parmotrema michauxianum (Zahlbr.) Hale | X | X | X | X | X | X | |
| Parmotrema perforatum (Jacq.) Massal. | X | X | X | X | X | X | |
| Parmotrema praesorediosum (Nyl.) Hale | | | | | | X | |
| Parmotrema rampoddense (Nyl.) Hale | | X | X | X | X | X | |
| Parmotrema rigidum (Lynge) Hale | | | | | X | X | |
| Parmotrema stuppeum (Taylor) Hale | | X | | | | | |
| Parmotrema tinctorum (Delise ex Nyl.) Hale | X | X | X | X | X | X | |
| Parmotrema ultralucens (Krog) Hale | X | X | X | X | X | X | |
| Parmotrema xanthinum (Müll. Arg.) Hale | X | X | X | X | X | | |
| Peltigera canina (L.) Willd. | X | X | X | | X | | |
| Peltigera elizabethae Gyelnik | X | | | | | | |
| Peltigera horizontalis (Hudson) Baumg. | X | | | | | | |
| Peltigera polydactylon (Necker) Hoffm. | | X | | | | | |
| Pertusaria amara (Ach.) Nyl. | X | X | X | | X | | |
| Pertusaria copiosa Erichsen | X | | X | X | X | X | |
| Pertusaria excludens Nyl. | | | X | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pertusaria leioplaca DC. | X | X | X | X | X | X | |
| Pertusaria macounii (Lamb) Dibben | X | X | X | X | | | |
| Pertusaria multipunctata (Turner) Nyl. | | X | X | | | | |
| Pertusaria multipunctoides Dibben | X | X | | X | X | | |
| Pertusaria neoscotica Lamb | X | X | | X | X | X | |
| Pertusaria ophthalmiza (Nyl.) Nyl. | X | X | X | X | X | | |
| Pertusaria ostiolata Dibben | X | X | X | X | X | X | |
| Pertusaria paratuberculifera Dibben | X | X | X | X | X | X | |
| Pertusaria plittiana Erichsen | X | X | | | | | |
| Pertusaria propinqua Müll. Arg. | | X | X | | X | | |
| Pertusaria pustulata (Ach.) Duby | | X | X | X | | | |
| Pertusaria rubefacta Erichsen | X | X | | | | | |
| Pertusaria sinusmexicani Dibben | X | X | X | X | X | X | |
| Pertusaria subpertusa Brodo | X | X | X | X | X | X | |
| Pertusaria tetrathalamia (Fée) Nyl. | X | X | X | X | X | X | |
| Pertusaria texana Müll. Arg. | X | X | X | X | X | X | |
| Pertusaria trachythallina Erichsen | | X | X | X | X | X | |
| Pertusaria valliculata Dibben | X | X | X | X | X | X | |
| Pertusaria velata (Turner) Nyl. | X | X | X | X | X | | |
| Pertusaria waghornei Hulting | X | | X | X | X | | |
| Pertusaria xanthodes Müll. Arg. | | | | | X | X | |
| Phaeographina spp. | | X | | | | | |
| Phaeographis dendritica (Ach.) Müll. Arg. | | | | | X | X | |
| Phaeographis dendriticella Müll. Arg. | | | | | X | | 2 |
| Phaeographis erumpens (Nyl.) Müll. Arg. | | X | | X | X | | |
| Phaeographis inusta (Ach.) Müll. Arg. | | X | X | X | X | X | |
| Phaeographis lobata (Eschw.) Müll. Arg. | | | | | X | | |
| Phaeophyscia adiastola (Essel.) Essl. | X | X | X | | X | | |
| Phaeophyscia ciliata Moberg | X | X | X | X | X | X | |
| Phaeophyscia imbricata (Vainio) Essl. | X | X | X | X | X | | 1 |
| Phaeophyscia pusilloides (Zahlbr.) Essl. | X | X | X | X | X | | |
| Phaeophyscia rubropulchra (Degel.) Moberg | X | X | X | X | X | | |
| Phlyctella andensis Nyl. | | | | | X | | 1 |
| Phlyctidia ludoviciensis Müll. Arg. | | X | | | | | |
| Phlyctis willeyi Tuck. | | X | | X | X | | 1 |
| Physcia aipolia (Ehrh. ex Humb.) Furnr. | X | X | X | X | X | X | |
| Physcia alba Müll. Arg. | | X | X | X | | | |
| Physcia americana G. Merr. | X | X | X | X | X | X | |
| Physcia crispa Nyl. | | | | X | X | X | |
| Physcia millegrana Degel. | X | X | X | X | X | X | |
| Physcia pseudospeciosa J.W. Thomson | | X | | | | | |
| Physcia sorediosa (Vainio) Lynge | | | | X | X | X | 1 |
| Physcia stellaris (L.) Nyl. | X | X | X | X | X | | |
| Physcia subtilis Degel. | X | X | | | | | |
| Physciella cloantha (Ach.) Essl. | X | X | | | | | |
| Physconia detersa (Nyl.) Poelt | X | X | X | | | | 1 |
| Placynthiella uliginosa (Shrader) Coppins & P. James | | | X | | | | 2 |
| Plagiocarpa hyalospora R.C. Harris | | | | | X | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Platismatia glauca (L.) Culb. & C. Culb. | X | | | | | | |
| Platismatia tuckermanii (Oakes) Culb. & C. Culb. | X | | | | | | |
| Polymeridium proponens (Nyl.) R.C. Harris | | | | | | X | |
| Polysporina simplex (Davies) Vezda | X | X | | | | | |
| Porina nucula Ach. | X | X | X | X | X | X | |
| Porina rhaphidosperma Müll. Arg. | X | X | X | | X | X | |
| Porpidia albocaerulescens (Wulfen) Hert. & Knoph | X | X | | | | | |
| Porpidia grisea Gowan | X | | | | | | |
| Pseudevernia consocians (Vainio) Hale & Culb. | X | | | | | | |
| Pseudocyphallaria aurata (Ach.) Vainio | X | X | | X | | | |
| Pseudoparmelia sphaerospora (Nyl.) Hale | | | | | X | X | |
| Pseudosagedia chlorotica (Ach.) Hafellner & Kalb | | | | | X | | |
| Punctelia appalachensis (Culb.) Krog | X | | | | | | |
| Punctelia bolliana (Müll. Arg.) Krog | X | | | | | | |
| Punctelia missouriensis Wilhelm & Ladd | | | X | | | | 2 |
| Punctelia rudecta (Ach.) Krog | X | X | X | X | X | X | |
| Punctelia subrudecta (Nyl.) Krog | X | X | | | | | |
| Pycnothelia papillaria Dufour | X | X | X | X | X | | 1 |
| Pyrenula aspistea (Ach.) Ach. | | X | | | | | |
| Pyrenula citriformis R.C. Harris | X | X | X | X | X | X | |
| Pyrenula concatervans (Nyl.) R.C. Harris | | | | X | X | X | |
| Pyrenula confoederata R.C. Harris | | | | X | X | | |
| Pyrenula cruenta (Müll. Arg.) Vainio | | | X | X | X | X | |
| Pyrenula leucostoma Ach. | X | X | | | | | |
| Pyrenula pseudobufonia (Rehm) R.C. Harris | | X | X | X | X | X | |
| Pyrenula punctella (Nyl.) Trevisan | | X | X | | | | |
| Pyrenula pyrenuloides (Mont.) R.C. Harris | | | | | X | X | |
| Pyrenula ravenelii (Tuck.) R.C. Harris | | X | | | | | |
| Pyrenula subelliptica (Tuck.) R.C. Harris | | | X | | | | |
| Pyrenula thelomorpha Tuck. | | | | | X | | |
| Pyrrhospora russula (Ach.) Hafellner | X | X | X | X | X | | |
| Pyrrhospora varians R.C. Harris | | X | X | X | X | X | |
| Pyxine caesiopruinosa (Tuck.) Imshaug | | X | X | X | X | X | |
| Pyxine eschweileri (Tuck.) Vainio | | | X | X | X | X | 1 |
| Pyxine sorediata (Ach.) Mont. | X | X | X | X | X | X | |
| Ramalina americana Hale | X | X | X | X | X | X | |
| Ramalina stenospora Müll. Arg. | | | | | | X | |
| Ramalina willeyi R. Howe | | | X | X | | X | |
| Rhizocarpon grande (Flörke ex Flotow) Arnold | | X | | | | | |
| Rhizocarpon obscuratum (Ach.) Massal. | | X | | | | | |
| Rimelia cetrata (Ach.) Hale & Fletcher | X | X | X | X | X | | |
| Rimelia reticulata (Taylor) Hale & Fletcher | X | X | X | X | X | X | |
| Rimelia subisidiosa (Müll. Arg.) Hale & Fletcher | X | X | X | X | X | X | |
| Rimeliella subtinctoria (Zahlbr.) Kurok | | X | X | | X | X | |
| Rinodina exigua (Ach.) Gray | | | | | | X | |
| Rinodina granuligera H. Magn. | | X | X | X | X | X | |
| Rinodina ochrocea Willey ex Fink | | X | | | | | |
| Rinodina sp.Tucker #25528 Tucker | | | X | X | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rinodina tephraspis (Tuck.) Herre | X | X | | | | | |
| Sarcographa medusulina (Nyl.) Müll. Arg. | | | | X | X | | |
| Sarcogyne clavus (DC.) Krempelh. | X | X | | X | | | |
| Schismatomma rediunta (Hasse) Tehler | | | | | | X | |
| Scoliciosporum umbrinum (Ach.) Arnold | | | | | | X | 2 |
| Staurothele diffractella (Nyl.) Tuck. | X | | | | X | | |
| Sticta weigelii Vainio | X | X | | | | | |
| Tephromela atra (Hudson) Hafellner | X | X | X | X | X | X | |
| Trapeliopsis flexuosa (Fr.) Coppins & P. James | | | X | | | | |
| Trypethelium floridanum (Zahlbr. ex Choisy) R. C. Harris | | | X | X | X | | |
| Trypethelium mastoideum (Ach.) Ach. | X | X | X | X | X | X | |
| Trypethelium tropicum (Ach.) Müll. Arg. | | X | X | X | X | | |
| Trypethelium virens Tuck. ex Michener | X | X | X | X | X | X | |
| Tuckermannopsis ciliaris (Ach.) Gyelnik | X | X | | X | X | | 1 |
| Tuckermannopsis fendleri (Nyl.) Hale | | | X | X | | | |
| Umbilicaria mammulata (Ach.) Tuck. | X | | | | | | |
| Usnea ceratina Ach. | X | X | X | | X | | |
| Usnea filipendula Stirton | X | X | | | | | |
| Usnea herrei Hale | | X | | | | | |
| Usnea mutabilis Stirton | X | X | X | X | X | X | |
| Usnea rubicunda Stirton | X | X | X | X | X | X | |
| Usnea strigosa (Ach.) Eaton | X | X | X | X | X | X | |
| Usnea subfloridana Stirton | X | X | | | | | |
| Usnea trichodea Ach. | X | | X | | | | |
| Vulpicida viridis (Schwein.) J.E. Mattsson & M.J.Lai | X | X | X | X | | | 1 |
| Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale | X | X | X | | | | 1 |
| Xanthoparmelia plittii (Gyelnk) Hale | X | X | X | | | | 1 |
| Xanthoparmelia somloensis (Gyelnk) Hale | | X | | X | | | |
| Xanthoparmelia subramigera (Gyelnk) Hale | X | X | X | X | X | | 1 |
| Xanthoparmelia tasmanica (Hook.F. & Taylor) Hale | X | X | | | | | |
| Xanthoria candelaria (L.) Th. Fr. | | X | X | X | X | | |
| Xanthoria elegans (Link) Th. Fr. | X | X | | | | | |

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[1] Physiographic regions: 1. Blue Ridge, 2. Southern Piedmont, 3. Carolina Sandhills, 4. Southern Coastal Plain, 5. Atlantic Coast Flatwoods, 6. Tidewater Area

[2] Range: 1: The species is more widely distributed within South Carolina than previously reported. 2: First report of occurrence in South Carolina. No number indicates that the species has previously been reported from the state.

Table 2 is a summary of the data from Table 1 showing the total number of species found in each physiographic region. Superficial examination of the data indicates only moderate difference in species number between most of the regions. However, if the size of the region is taken into account, the Blue Ridge Mountain Region (Region 1) is easily the richest in species diversity. This is not surprising in that this area has the greatest variety of habitats along with ideal conditions for lichen growth.

Table 2.

Summary of Lichen Distribution by Physiographic Region

| | Region | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Percent of state area | 2 | 33 | 12 | 15 | 27 | 10 |
| No. species per region | 197 | 267 | 220 | 182 | 212 | 163 |
| No. species per unit area | 98.5 | 8.1 | 18.3 | 12.1 | 7.9 | 16.3 |

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# The genus *Dichelyma* (Fontinalaceae: Musci) in Maine

Bruce Allen [1]

*Dichelyma* is one of three genera in the Fontinalaceae, which are often thought of as aquatic mosses. In fact *Fontinalis* is the only genus in the family with aquatic species. *Dichelyma, Brachelyma* and some species of *Fontinalis* are semi-aquatic mosses found along streams, brooks, lakes, ponds, and boggy depressions in the woods where they are seasonally inundated during periods of flood or high water. The family is best characterized by its odd peristome, especially its endostome. The exostome teeth are linear with the dorsal (outer) and ventral (inner) plates equally wide. The dorsal plates are vertically elongated, but deposition is thicker on the ventral rather than the dorsal surface with the ventral trabeculae especially heavily thickened. Both surfaces are papillose rather than horizontally striate. This type of exostome is found in several unrelated mosses and is closely approximated by the "daltoniaceous" exostome type found in many genera in the Hookeriaceae. This exostome type curves inward when the teeth are dry and outward when they are moist, a mode of action that is opposite the more common "hypnaceous" exostome type. This functional difference may account for the parallel development of this exostome type in a number of otherwise dissimilar mosses.

The endostome in the Fontinalaceae is firm rather than membraneous due to its relatively heavy secondary thickenings. But, secondary deposition is extremely localized, occurring primarily on the outer surface at and very near the wall pair sutures of the cells in the primary peristomal layer. Deposition on the inner surface occurs only where the cell walls of the inner peristomal layer cells are contiguous to the thickenings deposited by the primary peristome layer cells. A significant difference between the Fontinalaceae endostome and that of most other endostomes is its homogeneous structure, i.e., there is no division of the endostome into the basal membrane and the segment/cilia complex. As a result of its localized thickening and its homogeneous structure the Fontinalaceae endostome resembles a net consisting of 16 vertical

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filaments (each corresponding to the endostomial segment of a typical endostome) that are connected by nearly equidistant horizontal filaments. The entire net-like structure is termed a trellis.

When all the wall pair sutures in the primary peristomial layer of a Fontinalaceae endostome are secondarily thickened an unbroken net called a perfect trellis is formed. However, when some wall pair sutures lack secondary thickening an imperfect trellis results. Whether the trellis is perfect or imperfect all trellises have 16 vertical filaments. Thus, imperfect trellises are formed when some, usually basal, horizontal wall pair sutures are unthickened. Furthermore, if the vertical filaments of the Fontinalacae endostome are closely examined it can be seen that they have median lines on both the front and back surfaces. In contrast, most moss endostomes have vertical wall pairs (i.e., a median line) only on the outside of the segments. A somewhat similar type of endostomial segment is seen in *Funaria*, *Encalypta*, *Splachnum*, *Orthotrichum*, *Mittenia,* and *Timmia.* The combination, however, of an endostomial segment with median lines on both surfaces and a firm endostome having a homogenous structure consisting of vertical filaments connected by equidistant horizontal filaments is found only in the Fontinalaceae.

*Dichelyma* is likely to be confused only with *Drepanocladus*. Both genera are found in similar habitats, they have a similar aspect and color, long linear leaf cells, and strong single costae. *Drepanocladus*, however, has a typical hypnaceous peristome, differentiated alar cells that are often inflated, and plane to concave leaves that are never strongly keeled.

*Dichelyma* Myr., Kongl. Svenska Vetensk. Acad. Handl. 1832: 273. 1833.

Plants slender to robust, glossy, green to yellowish-green, golden-brown, seasonally inundated. Stems prostrate or pendent, irregularly branched. Leaves 3-ranked, distant or crowded, erect-spreading to spreading, secund, falcate or circinate, keeled and conduplicate, lanceolate to linear-lanceolate, acute to filiform-acuminate, margins entire to obscurely serrulate below, serrate to serrulate above; median leaf cells linear to linear-rhomboidal, alar cells firm-walled, quadrate or rectangular, not or slightly enlarged; costa subpercurent, percurrent, excurrent to long-excurrent. Dioicous. Perigonia gemmiform, lateral, in leaf axils, antheridia numerous, paraphyses present. Perichaetial leaves elongate, ecostate, sheathing the setae, archegonia numerous, paraphyses present. Setae short or long. Operculum conic, acute to obliquely rostrate. Capsule immersed, laterally emergent, emergent or exserted oval, oval-oblong, sucylindrical or cylindrical, stomata absent. Peristome diplolepideous. Exostome teeth inserted, shorter than endostome, linear, trabeculae widely spaced, yellow, orange or red, variously papillose, perforated along median line. Endostome segments linear, red to brownish-orange, papillose, joined by lateral bars only above (trellis imperfect) or throughout (perfect trellis). Spores 10--20 µm, spherical. Calyptra long-cucullate, covering the capsule and often clasping the base of the setae when young.

1. Leaves linear-lanceolate, setaceous; costa long-excurrent; capsules immersed to laterally emergent; endostome trellis incomplete ........................................................ 1. *D. capillaceum*
1. Leaves lanceolate, slenderly acute to obtuse; costa subpercurrent to short-excurrent; capsules immersed to laterally emergent OR exserted; endstome trellis complete or incomplete ....................................................................... 2

   2. Leaves 0.7--1.4 mm wide, acute; capsule exserted; endostome trellis complete; plants often saxicolous ..........2. *D. falcatum*
   2. Leaves 0.5--0.8 mm wide, acute or obtuse; capsules immersed to laterally emergent; endostome trellis incomplete; plants often corticolous ...........................................3. *D. pallescens*

1. *Dichelyma capillaceum* (With.) Myr., Kongl. Svenska Vetensk. Acad. Handl. 1832: 274. 1833. *Fontinalis capillacea* With., Syst. Arr. Brit. Pl (Ed. 4) 3: 773. 1801.

Plants slender, glossy, green to yellowish-green, brownish at base, stem up to 20 cm in length, irregularly branched. Leaves distant or crowded, erect-spreading, spreading to secund, keeled, 4--7 mm long, linear-lanceolate, filiform-acuminate, margins plane, entire to obscurely serrulate below, serrulate above; median leaf cells linear 6--8 x 60--120 µm, alar cells firm-walled, quadrate or rectangular, slightly enlarged;

costa long-excurrent, serrulate at apex. Dioicous. Perigonia gemmiform, lateral, in leaf axils, antheridia numerous, paraphyses present. Perichaetial leaves up to 7 mm long. sheathing the setae and overtopping the capsule, archegonia numerous, paraphyses present. Setae 3--5 mm long. Operculum obliquely long-rostrate, 0.5--1 mm long. Capsule immersed or laterally emergent, oblong-cylindric, 1--2 mm long. Peristome diplolepideous. Exostome teeth orange to red, linear-lanceolate, spiculose-papillose, perforated along median line. Endostome brownish-orange, longer than exostome teeth, spiculose-papillose, trellis imperfect, united only at the tips. Spores 10--15 µm, minutely papillose to smooth. Calyptra long-cuculllate, often clasping the base of the setae when young, 1.5--3 mm long.

On bark of tree trunks, branches, twigs, and roots or on rocks and boulders along the edges of lakes, ponds, and streams; often in seasonally submerged depressions in the woods. In Maine known from Androscoggin (*Allen 2429* MO), Hancock (*Rand*, NY), Kennebec (*Allen, Fontinalaceae Exsiccatae 88* MO), Knox (*Allen 15792* MO), Lincoln (*Allen, Fontinalaceae Exsiccatae 2* MO), Oxford (*Allen, Fontinalaceae Exsiccatae 89* MO), Waldo (*Johnson 37* NY), and Washington (*Allen 16280* MO) counties. Reported from Cumberland and Penobscot (Welch 1960) counties.

*Dichelyma capillaceum* is the most common species of *Dichelyma* in Maine. Unlike the usually saxicolous *D. falcatum* or corticolous *D. pallescens*, *D. capillaceum* is equally abundant on bark or rock. The plants are more slender than *D. falcatum* or *D. pallescens,* and the linear-lanceolate leaves are indistinctly keeled, weakly three-ranked, and have a long-excurrent costa that is often toothed or serrulate above. Sporophytically, *D. falcatum* differs from *D. capillaceum* in having exserted capsules and a perfect endostome trellis. The sporophytes of *D. capillaceum* and *D. pallescens* are more or less the identical, and the two species have been found growing together.

*Dichelyma capillaceum* can be confused with species of *Drepanocladus* (in the broad sense) which can be similar in size, color, and habitat preference. Many *Drepanocladus* species, however, have inflated alar cells, and they all differ from *D. capillaceum* in having plane to concave

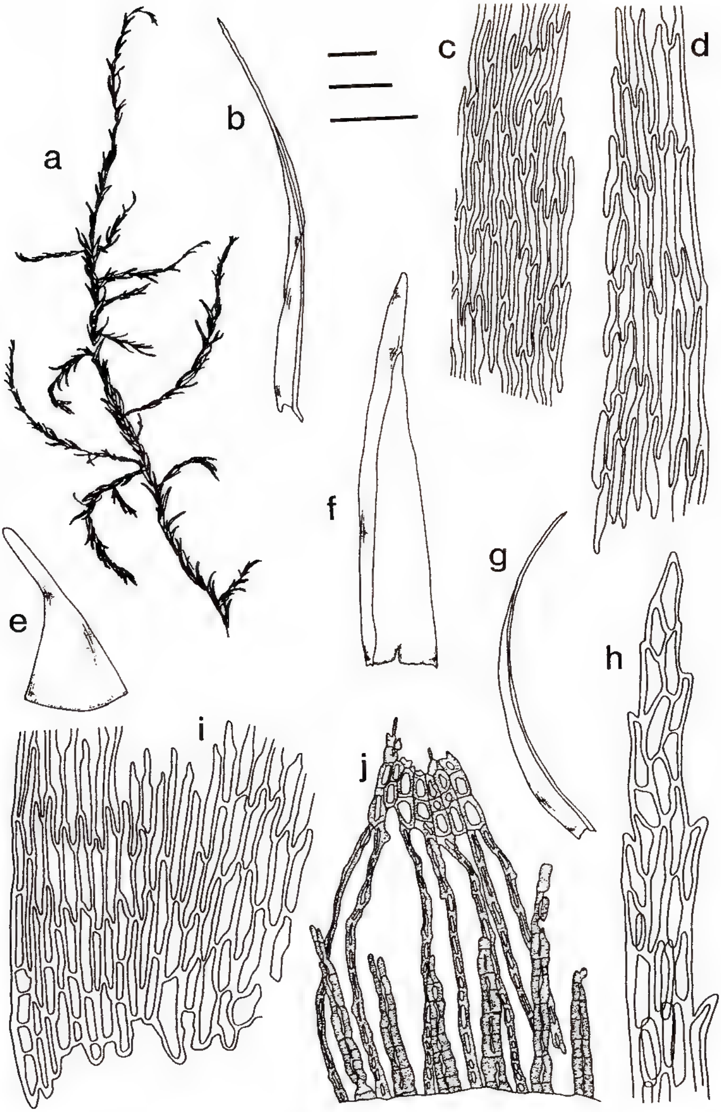

Figure 1. *Dichelyma capillaceum*. a. Habit. b. & g. Leaves. c. Basal leaf cells. d. Upper marginal leaf cells. e. Operculum. f. Calyptra. h. Leaf apex. i. Basal leaf cells in alar region. j. Peristome. Scales in mm: Upper bar = 0.5 (b,g); Middle bar = 0.1 (j); Middle bar = 0.5 (e); Lower bar = 0.05 (c,d,i,h); Lower bar = 0.5 (f). Habit (a) drawn 2x natural size. All figures drawn from *Fontinalaceae Exsiccatae 91* (MO).

leaves that are not three-ranked. In addition the sporophytes of *Drepanocladus* have exserted capsules with stomata, cross-striolate exostome teeth and a typical endostome consisting of a basal membrane, segments and cilia. *Blindia acuta*, commonly found on rocks and boulders in and along streams, ponds, and lakes, can also be confused with *Dichelyma capillaceum*. *Blindia*, however, is an acrocarpous moss which is generally much smaller than *D. capillaceum*. In addition, it has well-developed, inflated alar cells, concave leaves, elongated setae, and a single, haplolepideous peristome.

2. *Dichelyma falcatum* (Hedw.) Myr., Kongl. Svenska Vetensk. Acad. Handl. 1832: 274. 1833. *Fontinalis falcata* Hedw., Sp. Musc. Frond. 299. 1801.

Plants medium to robust, glossy, green, yellowish or yellow-brown, brownish at base, stem up to 15 cm in length, irregularly branched. Leaves crowded, strongly three-ranked, erect-spreading, spreading to secund, keeled, 3--5 mm long, lanceolate, subulate to acuminate, acute, margins plane or very narrowly recurved, entire below, serrulate above; median leaf cells linear 6-8 x 120--200 µm, alar cells firm-walled, quadrate or rectangular, slightly enlarged; costa subpercurrent, percurrent to short-excurrent. Dioicous. Perigonia gemmiform, lateral, in leaf axils, antheridia numerous, paraphyses present. Perichaetial leaves up to 7 mm long. sheathing the setae in lower 1/2-2/3, archegonia numerous, paraphyses present. Setae 10--15 mm long. Operculum obliquely long-rostrate, 0.5--1 mm long. Capsule exserted, oval to oblong-cylindric, 1--2 mm long. Peristome diplolepideous. Exostome teeth yellowish, linear-lanceolate, finely papillose, at times perforated along median line. Endostome yellowish, longer than exostome teeth, finely papillose, trellis perfect. Spores 12--14 µm, minutely papillose to smooth. Calyptra long-cucullate, often clasping the base of the setae when young, 3--6 mm long.

On rocks in and along brooks and on stream banks. In Maine known from Androscoggin (*Adams* NY), Franklin (*Lorenz* NY), Hancock (*Allen 2133* MO), Oxford (*Bailey* NY), and Piscataquis (*Dunham* MO) counties. Reported from Washington (Welch 1960) County.

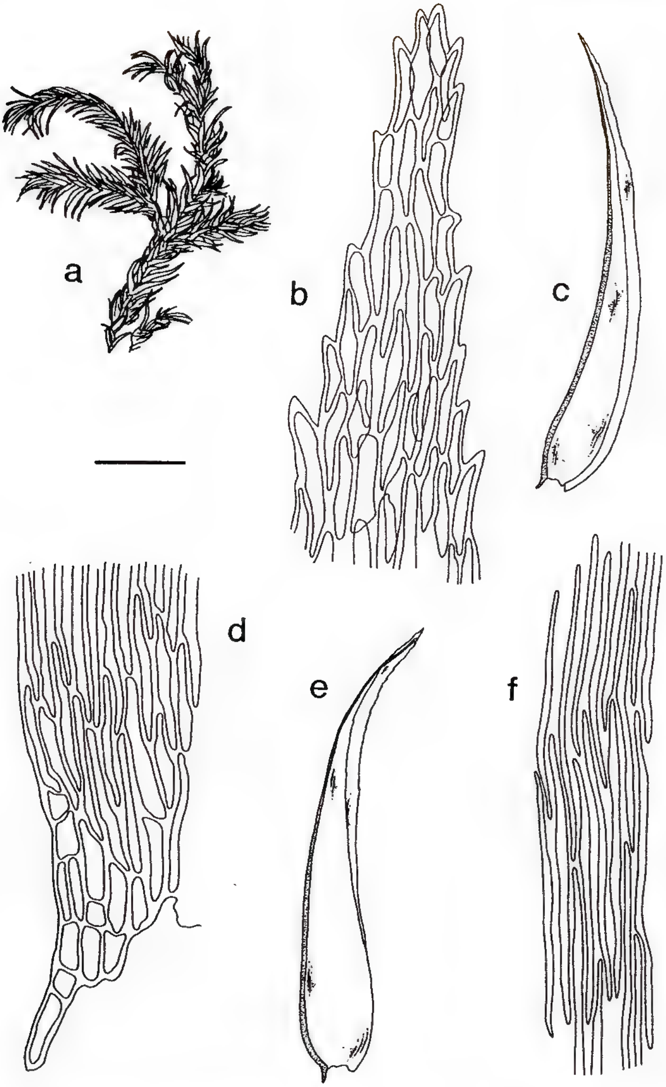

Figure 2. *Dichelyma falcatum*. a. Habit. b. Leaf apex. c. & e. Leaves. d. Basal leaf cells in alar region. f. Median leaf cells. Scales in mm: Bar = 0.05 (b,d,f); Bar = 0.5 (c,e). Habit (a) drawn 2x natural size.All figures drawn from *Allen 2133* (MO).

*Dichelyma falcatum* is the largest *Dichelyma* species in Maine and the only one to have exserted capsules with perfect endostomial trellises. Although its leaves are about the same length as those of the other species, they are much broader - *D. falcatum* 0.7--1.4 mm wide; *D. pallescens* and *D. capillaceum* 0.5--0.8 mm wide. In addition, the leaf cells of *D. falcatum* are considerably longer than those of the other two species. *Dichelyma capillaceum* also differs in its long excurrent costa; that of *D. falcatum* can be shortly excurrent but is usually percurrent to subpercurrent. *Dichelyma pallescens* is the only species likely to be confused with it since both species have similar costa lengths and variably acute leaves. *Dichelyma pallescens* usually grows on bark rather than on rocks and boulders, and its leaves have broader (frequently obtuse) leaf apices, but narrower leaf bases, the capsules are immersed to emergent, and the endostomial trellis imperfect.

3. *Dichelyma pallescens* Bruch & Schimp. *in* B.S.G., Bryol. Eur. 5: 24.1846.

Plants slender to medium sized, somewhat glossy, green, yellowish or yellow-brown, brownish at base, stem up to 10 cm in length, irregularly branched. Leaves crowded, weakly three-ranked, erect-spreading, spreading to secund or falcate, keeled, 3--4 mm long, lanceolate, subulate to acuminate, acute to obtuse, margins plane, entire below, serrulate above; median leaf cells linear 5-8 x 100--140 µm, alar cells firm-walled, quadrate or rectangular, slightly enlarged; costa subpercurrent to percurrent. Dioicous. Perigonia gemmiform, lateral, in leaf axils, antheridia numerous, paraphyses present. Perichaetial leaves up to 7 mm long. sheathing the setae and overtopping the capsule, archegonia numerous, paraphyses present. Setae 4--7 mm long. Operculum obliquely long-rostrate, 0.5--1 mm long. Capsule emergent, oval to oblong-cylindric, 1--2 mm long. Peristome diplolepideous. Exostome teeth reddish, linear-lanceolate, finely papillose, at times perforated along median line. Endostome reddish, longer than exostome teeth, finely papillose, trellis imperfect. Spores 10--15 µm, minutely papillose to smooth. Calyptra long-cucullate, often clasping the base of the setae when young, 3--4 mm long.

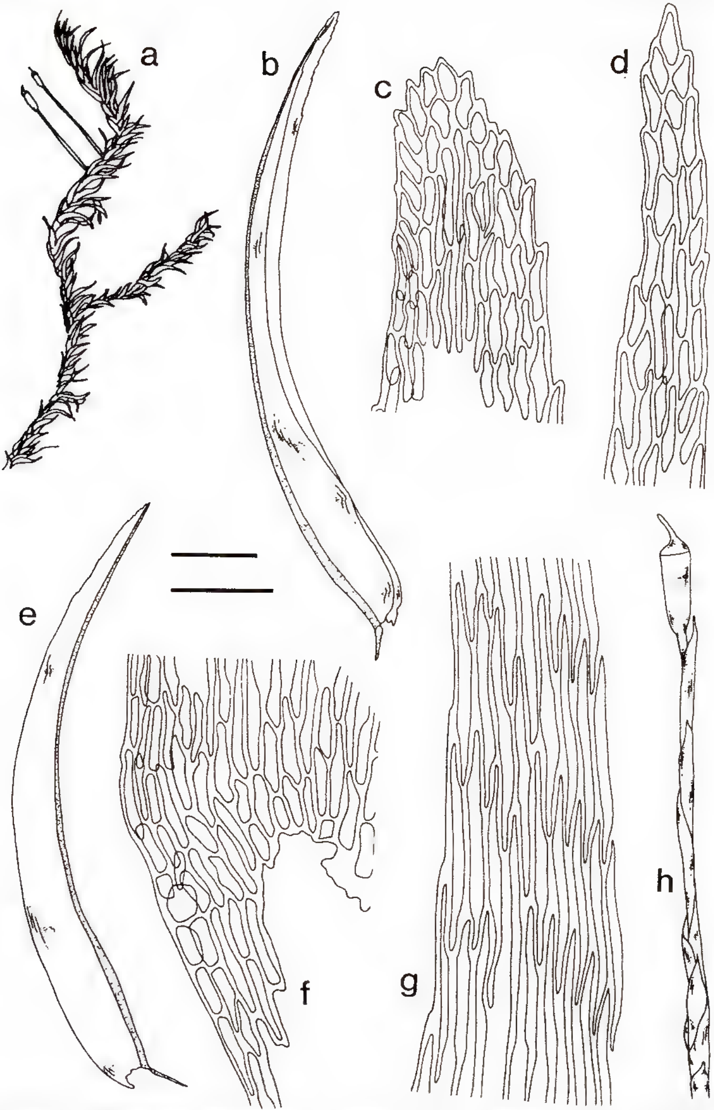

Figure 3. *Dichelyma pallescens*. a. Habit. b. & e. Leaves. c. & d. Leaf apices. f. Basal leaf cells in alar region. g. Median leaf cells. h. Sporophyte. Scales in mm: Upper bar = 0.05 (c,d,f,g); Upper bar = 0.5 (b,e); Lower bar = 2.0 (h). Habit (a) drawn 2x natural size. All figures drawn from *Fontinalaceae Exsiccatae 60* (MO).

On tree trunks, bushes and rocks subject to inundation. In Maine known from Androscoggin (*Parlin 13960* NY), Cumberland (*Blake* NY, US), Knox (*Crockett* DUKE, NY), Oxford (*Allen 10101* MO), Penobscot (*Merrill 117* MO), and Waldo (*Parlin 7281* NY) counties. Reported from Hancock (Patterson 1930) County.

*Dichelyma pallescens* is a medium sized species most easily confused with *D. falcatum*. Both species differ from *D. capillaceum* in having lanceolate leaves that are variously acute at the apex and percurrent to shortly excurrent costae. *Dichelyma capillaceum* has linear-lanceolate leaves that setaceous above and a long excurrent costa. *Dichelyma falcatum* is a larger species than *D. pallescens* its leaves are more strongly 3-ranked leaves, and its has long exserted capsules with perfect endostomial trellises. Although the leaves of both species are variably acute, those of *D. pallescens* are also frequently obtuse. *Dichelyma falcatum* is usually found growing on rocks while *D. pallescens* is more commonly found growing on bark.

# *Lescuraea saxicola*, New to Michigan and the Continental Interior

Howard Crum [1]

The moss flora of Michigan has been so well attended that one scarcely expects to find anything new. Yet, in 1960, Fred Hermann found *Lescuraea saxicola* (BSG) Milde at the northern tip of the state — not far from his boyhood home — on a granite boulder at the shore of Lake Medora, about four miles southwest of Copper Harbor (Keweenaw County). The moss grew with an admix of *Dicranoweisia crispula* (Hedw.) Lindb., and the leaves of that moss were partially covered with a blue-green algae, no doubt indicative of wetness.

The species occupies a disjointed range at northern latitudes in North America, Europe, and at least part of Asia. It grows on acid rock in alpine situations. It is certainly localized and may indeed be rare, but its small size and modest appearance no doubt keeps it safe from bryological predation. I have seen specimens from Greenland, Labrador, Nouveau Québec, Québec, Colorado, southeastern Alaska, British Columbia, and northern California. Lawton in her revision of the genus (1957) included Vermont, Utah, and Alberta. I have also examined material from northern and south-central Europe, the Caucasus, and Kasachstan.

The plants are small, irregularly branched, and shiny red-yellow. The slender stems and branches are often curved. Foliose paraphyllia are fairly numerous on stems. The leaves, erect-appressed when dry and often somewhat falcate, especially at tips of stems and branches, are ovate-lanceolate, gradually acuminate, and biplicate, with margins recurved nearly throughout and serrulate above. The midrib, fairly prominent at back and serrrulate above, stops just short of the leaf tip. The cells are elongate (2-4 : 1), rather thick-walled, and smooth or nearly so; those at alar regions are quadrate in groups extending inward to the plications. The capsules are erect and have greatly reduced endostomes.

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# Musgos del Valle de México: Pico La Biznaga (Atizapán de Zaragoza)

Angeles Cárdenas S.[1]

Como continuación de los estudios en el Valle de México (Cárdenas 1988, 1992), en esta contribución se presenta un listado de musgos del "Pico La Biznaga" localizado al occidente del Valle. Hasta ahora los trabajos en el área se habían realizado en las altas elevaciones circundantes que conservan remanentes de la vegetación original, pero no en zonas perturbadas que muestren las tendencias de los cambios sucesionales.

El Pico La Biznaga se localiza a los 19° 34' N 99° 17' W, a 15 km al NW de la Ciudad de México; dentro de sus límites se encuentra un encinar muy perturbado, rodeado por terrenos urbanizados. Se localiza entre la porción NW de la Sierra de Guadalupe y las estribaciones de la Sierra de Monte Bajo; su clima es templado, con lluvias en verano; la temperatura media anual oscila entre 15 y 16 °C y la precipitación media anual es de 700 mm.

Para la Sierra de Monte Bajo, Bracho (1985) registra 462 taxa de fanerógamas distribuidas en los siguientes tipos de vegetación: Bosque de *Quercus*, bosque de *Pinus*, pastizal de *Bouteloua-Hilaria*, bosque de galeria, pastizal secundario y flora ruderal, acuática y arvense; todos ellos se localizan en un perfil altitudinal comprendido entre 2450-2650 m que muestra la riqueza florística de la zona. Según Bracho (1985) esta riqueza debe estar influenciada por la perturbación humana que ha favorecido la diversidad de hábitats.

En noviembre de 1996, la recolección de musgos se realizó en un encinar con matorral y pastizal inducidos localizado a los 2290-2380 m de altitud. Se registraron 26 especies y variedades de musgos las cuales crecen de manera escasa. Aunque abundan los espacios abiertos, húmedos y con suelo compactado, los musgos cleistocárpicos son raros sólo se encontraron 2 taxa (*Pleuridium sullivantii* var. *mexicanum* y *Archidium* sp.). Las especies epífitas tampoco son frecuentes; en los troncos de los encinos únicamente se colectaron *Lindbergia mexicana* y *Tortula fragilis*.

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Aunque esta zona se ha declarado parque ecológico, es difícil esperar la recuperación del encinar debido a la baja humedad atmosférica y a la rápida evaporación, como ocurre en otras partes del Valle de México (Rzedowski & Rzedowski, 1979) y presuponen que la relativa escasez de epífitas (1% de las 2071 fanerógamas registradas; Rzedowski & Rzedowski, 1989) se debe a esos mismos factores y a la deforestación y urbanización rápida del área.

La lista que sigue incluye 26 especies y variedades de musgos; se han agregado el nombre del colector y el número de colecta; los ejemplares recolectados por el autor sólo se citan por número. Además se proporcionan datos del microhábitat.

*Archidium* sp. Delgadillo 6052. Suelo, lugares soleados y húmedos.

*Atrichum muelleri* Schimp. ex Besch. 5582; Delgadillo 6046. Suelo, lugares expuestos o sombreados y húmedos.

*Barbula spiralis* Schimp. ex C.M. 5592. Arena sobre roca, lugares expuestos y secos.

*Brachythecium stereopoma* (Spruce ex Mitt.) Jaeg. 5568. Roca, lugares sombreados y secos.

*Bryoerythrophyllum campylocarpum* (C.M.) Crum. 5574, 5590; Delgadillo 6051, 6058. Suelo, lugares sombreados o expuestos y secos o húmedos.

*B. inaequalifolium* (Tayl.) Zand. 5581. Suelo lugares sombreados y húmedos.

*Bryum apiculatum* Schwaegr. 5577. Suelo, lugares expuestos y secos.

*B. billarderi* Schwaegr. 5567. Roca, lugares expuestos y secos.

*Campylopus fragilis* (Brid.) B.S.G. 5584. Suelo, lugares expuestos y húmedos.

*Entodon beyrichii* (Schwaegr.) C.M. 5568 a, 5576. Roca, lugares sombreados o expuestos y secos.

*Epipterygium mexicanum (Besch.) Broth. Delgadillo 6056. Suelo, lugares sombreados y húmedos.*

*Fissidens crispus* Mont. 5575. Suelo, lugares sombreados y húmedos.

*Grimmia pulla* Card. Delgadillo 6055. Roca, lugares expuestos y secos.

*Lindbergia mexicana* (Besch.) Card. 5566, 5570. Tronco de *Quercus*, lugares sombreados y secos.

*Platygyriella pringlei* (Card.) Buck. Delgadillo 6049. Roca, lugares expuestos y secos.

*Pleuridium sullivantii* Aust. var. *mexicanum* (Card.) Cárde. 5580. Suelo compactado, lugares expuestos y húmedos.

*Pleurochaete squarrosa* (Brid.) Lindb. 5565; Delgadillo 6047, 6048; Martínez s.n. Nov. 1944, Cerro Pachuca. Roca, lugares expuestos y secos o húmedos. Aunque Crum (1951) la cita de Pachuca, no hay certeza sobre su situación dentro del Valle de México. Este es, por tanto, el primer registro fidedigno para esta zona.

*Pogonatum campylocarpum* (C.M.) Mitt. Delgadillo 6057. Suelo, lugares expuestos y secos.

*Pohlia oerstediana* (C.M.) Shaw. 5588. Suelo, lugares sombreados y secos.

*Racopilum tomentosum* (Hedw.) Brid. 5564 a. Suelo, lugares sombreados y húmedos.

*Rhynchostegium subrusciforme* (C.M.) Jaeg. Delgadillo 6054. Arenisca, lugares sombreados y húmedos.

*Thuidium delicatulum* (Hedw.) Schimp. var. *radicans* (Kindb.) Crum, Steere & Anders. 5583. Humus, lugares sombreados y húmedos.

*Tortella tortuosa* (Hedw.) Limpr. Delgadillo 6053. Suelo, lugares sombreados y secos.

*Tortula fragilis* Tayl. 5571, Delgadillo 6050. Tronco de *Quercus* o roca, lugares sombreados o soleados y secos.

*T. obtusissima* (C.M.) Mitt. 5591. Suelo cubriendo rocas, lugares expuestos y secos.

*Trichostomum brachydontium* Bruch ex F. Muell. 5573, 5579. Suelo, lugares expuestos y secos.

**Agradecimientos.** Al Dr. Claudio Delgadillo por la revisión crítica del manuscrito y su apoyo en el trabajo de campo; a Daniel Tejero por facilitar el acceso al parque.

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## New Book Offers Guide to Pacific Northwest Lichens

A key component in healthy ecosystems, lichens can be found in almost any natural habitat in the Pacific Northwest. A new book published by the Oregon State University Press provides the first comprehensive guide to the region's lichens.

"Macrolichens of the Pacific Northwest" by Bruce McCune and Linda Geiser (June 1997, 400 pages) includes keys to 495 species of lichens—all those known or expected to occur in Oregon and Washington. The keys also provide reasonable coverage for lichens of Idaho and Montana, inland to the Continental Divide.

Color photographs, line drawings, and full-page detailed descriptions are provided for over 200 species, emphasizing those found in forested ecosystems. The illustrated glossary and appendices cover the terminology needed to identify lichens and provide information on collection and handling. The biology and ecology of lichens are discussed, and regional air quality sensitivities are provided for more than 100 species.

Bruce McCune is associate professor of botany and plant pathology at Oregon State University. Linda Geiser is an ecologist and air quality specialist for the U.S. Forest Service in Corvallis, Oregon. The book features photographs by Sylvia and Stephen Sharnoff and drawings by Alexander Mikulin.

"Macrolichens of the Pacific Northwest," a co-publication with the U.S.D.A. Forest Service, is available from the OSU Press, Waldo Hall 101, Corvallis, OR 97331, (541) 737-3166, FAX (541) 737-3170. The price of the paperback book is $25.95. Mail orders must include $2.50 for book rate postage or $5.00 for UPS for the first book and 75¢ for each additional book.

# The genus *Rhodobryum* (Musci: Bryaceae) in Maine

Bruce Allen[1]

*Rhodobryum* is a genus of robust mosses with a strongly rosulate habit, subterraneous stolons, a costa in cross-section that either lacks or has only a small cluster of dorsal stereids, and is usually polysetous. There has been consider debate about whether or not the taxon should be recognized as a subgenus of *Bryum* or as a distinct genus. *Bryum* is a large, complex genus that displays a consider amount of homoplasy. There are *Bryum* species with rosulate habits (some exhibiting polysety) and a few species that are larger than many *Rhodobryum* species. The subterranean stolons characteristically found in *Rhodobryum* are not encountered in *Bryum*, but they can be to difficult demonstrate and are not present in all collections of *Rhodobryum*. Furthermore, the morphological distinctions between *Rhodobryum* stolons and the stems of *Bryum* species that are strongly verticillate are not so clearly marked. The most distinctive character in *Rhodobryum* is found in its costa. In nearly all species the costa lacks dorsal stereids. Indeed, this character in combination with those noted above is adequate to separate this taxon at the generic level from *Bryum*. Unfortunately, in preserving the spelling of *Rhodobryum* (Isoviita & Koponen 1984) the genus has been conserved with *R. roseum* rather than *R. leucocanthum* Hampe (= *R. aubertii* (Schwaegr.) Thér.) as the type species: *R. roseum* has dorsal stereids in its costa, while *R. leucocanthum* does not. Iwatsuki & Koponen (1972) make a quantitative distinction between the dorsal stereids in *R. roseum* (and *R. ontariense)* and those in a typical *Bryum*-type of costa, but their own figures (Fig. 2 d,k,o,p, Fig. 4 k) as well as those of Mohamed (1984) are not convincingly different.

*Rhodobryum* (Schimp.) Limpr., Laubm. Deutschl. 2: 444. 1892, *nom.cons*
*Bryum* subg. *Rhodobryum* Schimp., Syn. Musc. Eur. 381. 1860.

Plants large to robust, dark-green to yellowish-green in loose tufts; erect stems rosulate from subterranean stolons, often verticillate, rhizoids reddish-brown, papillose, densely clothing the stem. Lower leaves erect,

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small and distantly spaced, upper leaves enlarged and densely clustered, oblong-ovate to obovate-oblong, broadly acute to shortly acuminate, margins strongly to weakly bordered, narrowly recurved at base or up to 2/3 the leaf length, single or double toothed above; costa strong, percurrent to excurrent, in cross-section with 2-4 ventral rows of enlarged, hyaline cells, a small central strand, dorsal stereids absent or present as a small bundle; upper cells large and broad, rhombic to rhomboidal, lower cells elongate-rectangular. Setae terminal, 1-5 per perichaetium, smooth. Capsules cylindrical to oblong-pyriform, inclined to pendent; annulus well-developed, revoluble; operculum conic-apiculate. Peristome perfect; exostome densely and finely papillose below, papillose above, strongly trabeculate at back; endostome lightly papillose, basal membrane to 1/2--2/3 of exostome teeth length, segments well developed, broadly perforate, cilia 2-3, appendiculate or nodose. Spores smooth to lightly papillose.

*Rhodobryum ontariense* (Kindb.) Kindb., Eur. N. Amer. Bryin. 2: 346. 1897.
*Bryum ontariense* Kindb., Ottawa Naturalist 2: 155. 1889.

Plants robust, dark-green to light-green, in dense tufts to 2--5 cm high; rhizoids reddish-brown, papillose, densely developed on stems and stolons, also arising from basal leaf cells. Leaves 9--13 x 4--5 mm, distinctly rosulate, erect, stiff, variously twisted and contorted with non-undulating margins dry, spreading wet, obovate-oblong, cuspidate, not or weakly decurrent at base; indistinctly bordered by 1-2 rows of somewhat longer and narrower, weakly differentiated cells, margins recurved in lower 2/3, plane above, sharply serrate in upper half, the teeth single; costa shortly excurrent, in cross-section at base with well defined cluster of dorsal stereids; upper cells rhomboidal to rhomboidal-hexagonal, thin-walled, 50--110 x 20--30 m, basal cells long-rectangular, 140--230 x 40--50 m, alar cells shorter and broader, otherwise weakly differentiated. Dioicous. Setae 1--5 per perichaetum, 40--55 mm long, dark-red. Capsules 5--7 mm long, cylindrical to oblong-pyriform, weakly striate when dry, inclined to pendent, neck short; opercula 1--1.3 mm long, conic; peristome perfect; exostome teeth red-yellow, densely and finely papillose below, papillose above, trabeculate at back; endostome yellowish-hyaline, lightly papillose, basal membrane to 1/2--2/3 of exostome teeth length, segments well developed, broadly perforate, cilia 2-3, appendiculate. Spores 16--22 µm, lightly papillose.

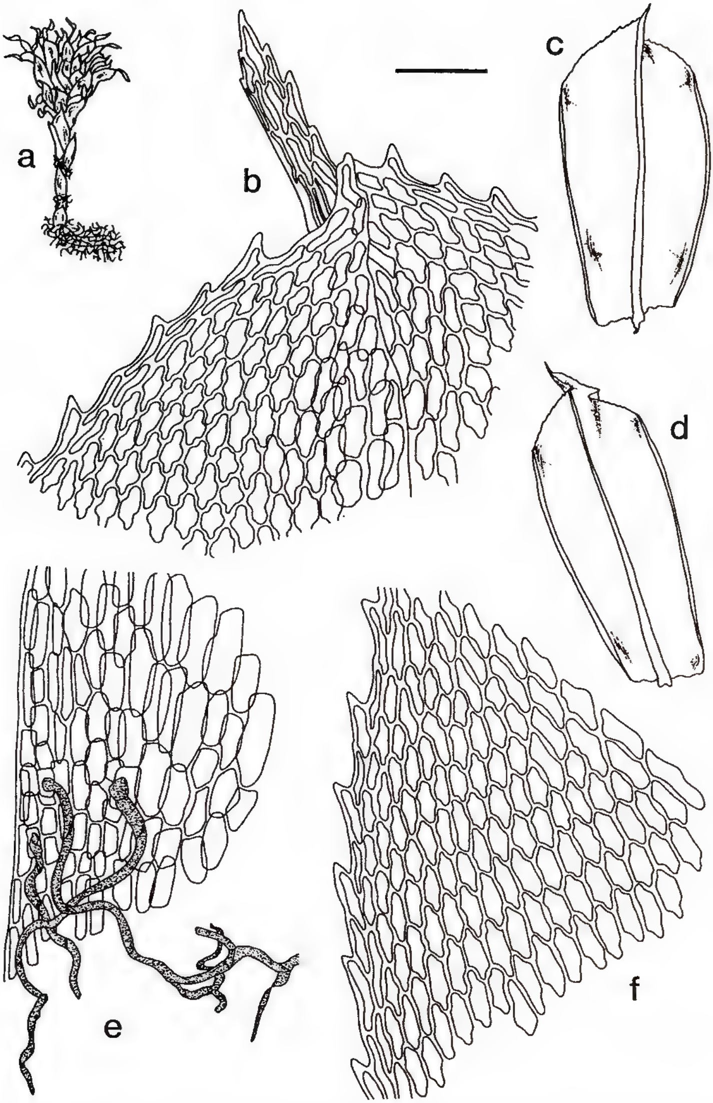

Figure 1. *Rhodobryum ontariense*. a. Habit. b. Leaf apex. c. & d. Leaves. e. Basal leaf cells in alar region with rhizoids from basal leaf cells. f. Median leaf margin and cells. Scale in mm: = 0.1 (b,e,f); = 2.0 (c,d); = 8.5 (a). All figures drawn from *Allen 9336* (MO).

On boulders, rock outcrops (limestone and granitic), stumps, or humus in woods. In Maine known from Androscoggin (*Parlin* MAINE), Cumberland (*Lowe* MAINE), Hancock (*Merrill* MAINE), Kennebec (*Soule* MAINE), Penobscot (*Merrill 119* MO), Oxford (*J.A. Allen* MO), and Somerset (*Allen 9336 MO)* Counties.

*Rhodobryum ontariense* is one of the prettiest mosses in the Maine flora. It is a robust species, dark-green in color, often occurs in large, thick mats, and has upper leaves clustered in rosettes. The species has weakly bordered, sharply serrate leaves with margins narrowly recurved in the lower 2/3 of the leaf. Ochi (1981, 1994) and Crum & Anderson (1981) considered *R. ontariense* to be the same as *R. roseum*. The differences between *R. roseum* and *R. ontariense* have been given in detail by Iwatsuki and Koponen (1972) ). The few collections from Maine belong to *R. ontariense* as judged by thier lack of subapical branching, large number of comal leaves that are erect and twisted when dry, strongly revolute leaf margins with large, sharply serrate teeth, and shortly excurrent costae that have the stereid band extending to the epidermis.

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# Mosses from the Interior Highlands of North America, states of Missouri and and Oklahoma, *Plagiomnium ellipticum* new to Oklahoma, and other new county records

Carl Darigo[1]

This paper reports on mosses from the Interior Highlands of North America, including *Plagiomnium ellipticum* (Brid.) T. Kop. new to Oklahoma, plus 45 new county records in Missouri (Fig. 1) and Oklahoma (Fig. 2).

The Interior Highlands of North America encompass the southern portion of Missouri, much of Arkansas, a small region in southern Illinois and extend along the eastern border of Oklahoma.

The Missouri River cuts, in an approximate east-west direction, through the state of Missouri. North of the river is found the Glaciated Prairie, an area that occupies about the northern one-third of the state. South of the river lies the northern edge of the Interior Highlands. The Springfield Plateau occupies the northwestern part, while northern and northeastern section consists of the Salem Plateau, with the most common habitat being oak-hickory forests. Within the Salem Plateau in southeastern Missouri lies the St. Francois Mountains. The Prairie section is immediately west of the Springfield Plateau, while the Border region occupies the first tier of counties north of the Missouri River. In eastern Oklahoma, several counties form the western limits of the Springfield Plateau and Boston Mountains, the latter concentrated mainly in Arkansas.

Collections were made either during Botany Group outings of the Webster Groves Nature Study Society, or on private trips. Several previously unpublished collections by Robert Magill are included.

The Oklahoma data resulted from determinations of Gilford J. Ikenberry specimens collected during the period 1947 to 1950. The

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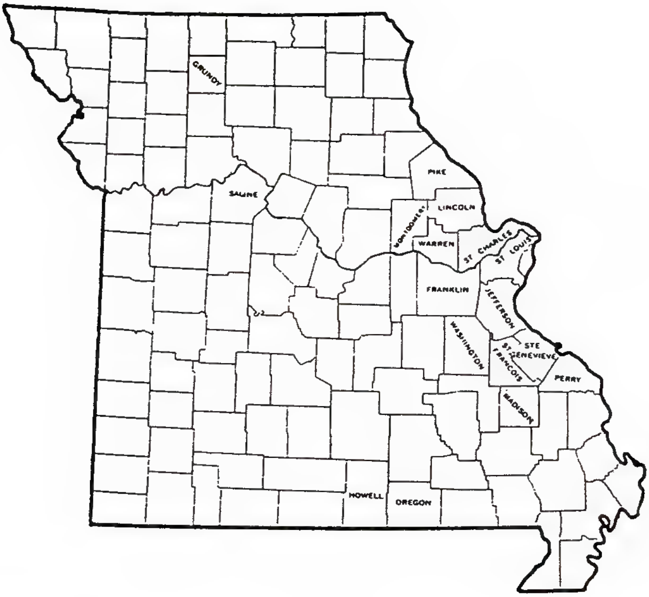
Ikenberry collections, including many made in New Mexico in the 1930's, were purchased by the Missouri Botanical Garden in 1981. Gilford J. Ikenberry was born in 1890 in Nebraska, graduated from Kansas State University in 1912 and obtained his master's degree from the same school in 1924. After teaching botany in various schools in Kansas and North Dakota, Ikenberry received his PhD degree in botany from Ohio State University in 1933. Dr. Ikenberry was with the U. S. Forest Service in California from 1933 to 1935, then taught at Eastern New Mexico University from 1935 to 1939. He taught botany at Oklahoma State University until retirement in 1960. Dr. Ikenberry was very interested in bryophytes and with his colleagues collected many moss specimens, mainly in New Mexico, Oklahoma, North Dakota, northern Michigan, California, Ohio and Vermont.

New records were distributed as follow:

OKLAHOMA
  Boston Mountains--2: Adair (1), Muskogee (1)
  Springfield Plateau--1: Delaware (1)



MISSOURI

Glaciated Prairie--5: Grundy (2), Pike (3).
Border--13: Lincoln (1), Montgomery (2), St. Charles (4), Warren (6).
Salem Plateau--18: Franklin (1), Howell (1), Jefferson (6), Oregon (2), Perry (3), St. Francois (2), St. Louis (1), Ste. Genevieve (1), Washington (1).
Prairie--2: Saline (2).St. Francois Mountains--5: Madison (5).

All specimens were verified by Bruce Allen and are deposited at MO. Distribution comments were taken from Redfearn (1983).

AMBLYSTEGIACEAE

*Amblystegium serpens* (Hedw.) Schimp. in B.S.G. var. *serpens* - Madison: Amidon Conservation Area, Darigo & Darigo 2812.

*Campylium hispidulum* (Brid.) Mitt. - St. Charles: Weldon Spring Conservation Area, Darigo 2824.

*Leptodictyum humile* (P. Beauv.) Ochyra - Madison: Amidon Conservation Area, Darigo & Darigo 2814.

*L. riparium* (Hedw.) Warnst. - Saline: Arrow Rock State Historic Site, Darigo & Darigo 2706. This collection is the "laxirete expression" version, found in flowing water.

ANOMODONTACEAE

*Anomodon minor* (Hedw.) Fürnr. - Saline: Van Meter State Park, Darigo & Darigo 2705.

BRACHYTHECIACEAE

*Brachythecium acuminatum* (Hedw.) Aust. var. *acuminatum* - Jefferson: Young Conservation Area, Darigo 2624. Pike: churchyard east of Eolia, Darigo & Darigo 2786.

*B. acuminatum* (Hedw.) Aust. var. *cyrtophyllum* (Kindb.) Redf. & Crum - Madison: Amidon Conservation Area, Darigo & Darigo 2816. Common, but infrequently collected; differs from var. *acuminatum* in having shorter, broader, more concave and acute leaves, and shorter leaf cells.

*B. plumosum* (Hedw.) Schimp. in B.S.G. - Franklin: Robertsville State Park, Darigo 2809. Uncommon.

*Bryhnia graminicolor* (Brid.) Grout - Warren: Reifsnider Conservation Area, Darigo & Darigo 2818.

*Eurhynchium hians* (Hedw.) Sande-Lac. - Ste. Genevieve: Magnolia Hollow Conservation Area, Darigo & Darigo 2803.

*E. pulchellum* (Hedw.) Jenn. var. *pulchellum* - Warren: Reifsnider Conservation Area, Darigo & Darigo 2819.

*Steercleus serrulatus* (Hedw.) Robins. - Madison: Amidon Conservation Area, Darigo & Darigo 2815.

BRYACEAE

*Bryum argenteum* Hedw. - Washington: Washington State Park, Darigo & Darigo 2830.

*B. dichotomum* Hedw. - Howell: in West Plains, Darigo & Haller 2856. St. Louis: Babler State Park, Darigo 2763. Uncommon.

*B. klinggraeffii.* Schimp. *in* Klinggr. - Warren: Katy Trail State Park, near Treloar, Darigo & Darigo 2837. apparently rare, has been previously collected only once (1906) in Missouri. Shown as SU (Status Undetermined) on Missouri Rare and Endangered Species Checklist.

*B. pseudotriquetrum* (Hedw.) Gaertn. et al. - Jefferson: Victoria Glades Conservation Area, Darigo 2660.

### DITRICHACEAE

*Ditrichum pallidum* (Hedw.) Hampe - St. Charles: Weldon Spring Conservation Area, Darigo 2825.

### ENTODONTACEAE

*Entodon seductrix* (Hedw.) C. Müll - Grundy: Crowder State Park, Darigo & Darigo 2701.

### FABRONIACEAE

*Fabronia ciliaris* (Brid.) Brid. var. *ciliaris* - Jefferson: 6.5 miles west of DeSoto, Magill 10032.

### FUNARIACEAE

*Physcomitrium pyriforme* (Hedw.) Hampe - Warren: Katy Trail State Park, near Dutzow, Darigo 2864

### GRIMMIACEAE

*Grimmia laevigata* (Brid.) Brid.- Oregon: Camp Hollow Glade, Mark Twain National Forest, Darigo & Haller 2859

*Schistidium apocarpum* (Hedw.) Bruch & Schimp. in B.S.G.- Madison: Amidon Conservation Area, Darigo & Darigo 2813. Montgomery: Graham Cave State Park, Darigo & Darigo 2800. Warren: Reifsnider Conservation Area, Darigo & Darigo 2821.

*S. rivulare* (Brid.) Podp. var. *rivulare* - St. Francois: St. Francois State Park, Darigo 2612.

### HYPNACEAE

*Homomallium adnatum* (Hedw.) Broth. - Warren: Reifsnider Conservation Area, Darigo & Darigo 2820.

*Pylaisiella selwynii* (Kindb.) Crum et al. - St. Charles: Busch Conservation Area, Darigo 2806.

### LESKEACEAE

*Leskea gracilescens* Hedw. - Pike: Hamburg Ferry Access, Darigo & Darigo 2785.

*Lindbergia brachyptera* (Mitt.) Kindb. - Grundy: Crowder State Park, Darigo & Darigo 2700.

LEUCOBRYACEAE

*Leucobryum glaucum* (Hedw.) Ångstr. *in* Fries - Adair-OK: 1.5 miles south of Stilwell, Morrison (GJI).

LEUCODONTACEAE

*Leucodon julaceus* (Hedw.) Sull. - Montgomery: Graham Cave State Park, Darigo & Darigo 2799.

MNIACEAE

*Plagiomnium cuspidatum* (Hedw.) T. Kop. - Perry: Ball Mill Resurgence Natural Area, Darigo & Darigo 2772.

*P. ellipticum* (Brid.) T. Kop. - Delaware-OK: Dripping Springs, 6 miles west of Siloam Springs AK, Waterfall (GJI). Collected 7 July 1950 from a moist, shaded gorge (T20N, R25E, section 32, NW ¼); mixed with *Brachythecium rivulare* Schimp. *in* B.S.G. *Plagiomnium ellipticum* has been reported in the Middle West and eastern North America, but is rare in the Interior Highlands. In Missouri, the species has been found in only four counties and is listed as Rare on the Missouri Rare and Endangered Species Checklist.

ORTHOTRICHACEAE

*Drummondia prorepens* (Hedw.) Britt. - Jefferson: 6.5 miles west of DeSoto, Magill 10031.

*Orthotrichum. pusillum* Mitt.- Perry: Ball Mill Resurgence Natural Area, Darigo & Darigo 2773. Muskogee-OK: near Braggs, Ikenberry 1832.

POLYTRICHACEAE

*Atrichum angustatum* (Brid.) Bruch & Schimp. in B.S.G. - Pike: churchyard east of Eolia, Darigo & Darigo 2787.

POTTIACEAE

*Syntrichia pagorum* (Milde) Amman - Lincoln: Cuivre River State Park, Darigo & Darigo 2778. Perry: Ball Mill Resurgence Natural Area, Darigo & Darigo 2774. St. Charles: Busch Conservation Area, Darigo 2807.

*Weissia jamaicensis* (Mitt.) Grout - Jefferson: Valley View Glades, Darigo 2846

*W. sharpii* Anderson & Lemmon - Jefferson: 6.5 miles west of DeSoto, Magill 10036. St. Francois: St. Francois State Park, Darigo 2611. This species, which differs from *W. controversa* Hedw. in having larger leaf cells and wider costa, has been previously found in only four other Missouri counties.

THUIDIACEAE

*Thuidium delicatulum* (Hedw.) Schimp. *in* B.S.G.- Oregon: Paty Hollow, Mark Twain National Forest, Darigo 2857.

**Acknowledgments**: The author wishes to thank Robert Magill for permission to publish his collections, Lewis Anderson for verifying a *Weissia sharpii* specimen, Frank Bowers for use of his Oklahoma Checklist (1991), Steve Churchill for furnishing information on the Ikenberry biography, Bruce Allen for sharing his time and expertise, Dolly Darigo and Karen Haller for their collecting help, and also Father James Sullivan and other Webster Groves Nature Study Society members for their interesting outings.

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# EVANSIA

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# Reinstatement of *Lecidea cyrtidia* Tuck. in the North American lichen checklist

Richard C. Harris[1]

I began this little project with two goals. First to review the application of the name *Lecidea chalybeiza* Nyl., recently taken up in the North American checklist for *Lecidea cyrtidia* Tuck. (Esslinger & Egan, 1995). The second was, having established a correct name, to consider if the species was closely enough related to *Micarea erratica* (Körber) Hertel, Rambold & Pietschmann to warrant its transfer to *Micarea* as well.

For a few years after the publication of Hertel (1977), where *Lecidea cyrtidia* Tuck. (Proc. Amer. Acad. Arts Sci. 12: 181. 1877) was synonymized with *Lecidea chalybeiza* Nyl. (Flora 50: 440. 1867), I used the name *Lecidea chalybeiza*. However, in the mid-1980's I reverted to *Lecidea cyrtidia*, mainly for chauvinistic reasons, but also because Hertel's description did not seem to fit American specimens (epihymenium "schmutzig olivgrün bis grauschwarz" and exciple "olivgrüner bis schwarzgrüner Rindenzone"). Egan (1987) did not pick up Hertel's (1977) synonymization but it was rediscovered by Wong and Brodo (1992) and consequently taken up by Esslinger and Egan (1995). *Lecidea chalybeiza* was assigned with question to synonymy with *Micarea erratica* by Rambold (1989).

The type specimen of *Lecidea chalybeiza* (New Zealand, Otago, ad saxa, ex hb. Jones, H-NYL 20312) consists of three apothecia (no thallus) glued to the packet. One of these had been sectioned previously. With considerable trepidation I removed another thin section from this apothecium. Fortunately the apothecium was in good condition and all the necessary characters were readily ascertainable. The epihymenium and outer exciple are dark green, the inner exciple is paler, streaked with green outward and with brown inward, and the hypothecium is dark brown. The few ascospores seen were 5–6 x 3–3.5 µm, a little shorter than recorded by Nylander (5–8 x 2.5–3.5 µm). This same section treated with KOH and modified Lugol's iodine had asci with a distinct dark apical tube. Assuming the thallus is not distinctive, *Lecidea chalybeiza* Nyl. (1867) is clearly a later synonym of *Lecidea erratica* Körber (1861) [= *Micarea erratica* (Körber) Hertel, Rambold & Pietschmann] in the currently accepted sense. (I have not examined the type.)

---

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*Lecidea cyrtidia* and *Micarea erratica* have been considered easily confusable (and perhaps closely related) due to similar habitat, somewhat similar aspect, dark hypothecium and small ascospores. Magnusson (1936) and Hertel (1969) seemed to have misnamed Cummings Lich. bor.-am. 212 as *L. cyrtidia* and Hertel (1977) cited *L. cyrtidia* as a synonym of *L. chalybeiza*. My original idea was that the two species being ostensibly so similar, it would be tidier if both species were in the same genus, removing another species from the meaningless puddle, *Lecidea* s. lat. After examining the lectotype (selected by Hertel, 1975; Missouri, Macon County, 1871, *Hall 39*, FH), the syntype (Massachusetts, Quincy, 1871, *Willey*, FH) and 31 specimens at NY, I have concluded that transferring *L. cyrtidia* to *Micarea* at this time is unwise. *Lecidea cyrtidia* is distinctive in uniformly brown pigmentation, paraphyses with swollen tips with a yellow-brown cap, a pale yellowish-brown exciple with a thin dark brown outer layer consisting of radiating hyphae similar to the paraphyses with swollen, brown capped tips, brown pigment granules between the excipular hyphae, hymenium usually sordid yellowish, dark brown hypothecium, ascus with a KI+ apical tube and small ascospores, 6-10 x 2.5-3.5 µm. *Micarea erratica* has green pigments in epihymenium and exciple, tips of paraphyses not notably swollen, without caps, embedded in the pigmented epihymenial layer, and the excipular hyphae with a thick colorless sheath, hypothecium, asci and ascospores similar to *L. cyrtidia*. (Magnusson (1936) and Lowe (1939) provided more detailed descriptions.) Lowe (1939) suggested *L. cyrtidia* is closely related to *L. plebeja* Nyl. Since I am ignorant regarding the micromorphology of lecanoralean ascus types, I am unable to say if the asci of *L. cyrtidia* should be considered truly of the *Micarea*-type. This, combined with the differences noted above, leaves me reluctant to transfer *L. cyrtidia* to *Micarea*. On the other hand, *Micarea erratica* was not considered to belong in *Micarea* by the monographer (Coppins, 1983) and its inclusion represents an expansion of the generic limits. I am somewhat tempted to expand those limits a little more.

However, cowardice prevails and *Lecidea cyrtidia* is left lingering in *Lecidea* limbo.

*Lecidea cyrtidia* is a rather uniform species. The thallus is usually thin, mostly continuous and brown or brownish green, without an obvious prothallus, rare variants have an endolithic thallus, a thicker, discontinuous to areolate thallus (only one collection seen with what I would call a "thick" thallus) or a paler, brownish gray thallus. The apothecia in the types and about half the specimens examined are black, convex, with the margin excluded. In other specimens the apothecia remain flat and have a persistent, slight raised margin. In ca. 20% of the collections the disk is brown and the margin black, with the extreme being a single collection lacking epithecial pigmentation, having a whitish disk. A few of the more southern collections tend to lack the brown pigment granules between the excipular hyphae but since variations from few to none were observed, I attach no significance to this pending further study. Ascospore variation was not studied. Casual attempts, without success, were made to locate pycnidia. Most, perhaps all, collections come from wooded, presumably rather shaded, habitats, on small non-calcareous rocks from naturally eroded banks and mounds or from human disturbed areas along roads and trails. One collection from Kentucky was on shale along a stream where it would have been inundated at high water. *Porpidia crustulata* (Ach.) Hertel & Knoph is a common associate. I have examined material from Arkansas, northern Georgia, Kentucky, Maryland, Massachusetts, Missouri, North Carolina, northern South Carolina, Tennessee, Virginia and West Virginia. Brodo (pers. comm.) has seen material from southern Quebec and New Brunswick. It is somewhat odd that Lowe (1939) did not find it in his very thorough study in northern New York. The southern boundary at the southern edge of the Appalachians is typical. NY does not have appropriate collections to define the western range limits. *Lecidea cyrtidia* is reported from Finland (Magnusson, 1936; Hertel, 1969) based on the type of *Lecidea lapillicola* Vainio. Lowe (1939) doubted this synonymy and based on the American distribution, I think its occurrence in Europe needs to be re-examined. Hertel (1969) suggested that *Lecidea micytho* Tuck. may also be a synonym of *L. cyrtidia*. Based on Magnusson's (1936) and Hertel's (1969) descriptions, this seems unlikely. Judging from a couple specimens at NY possibly referable to *L. micytho*, it has a distinctive thallus with apothecial characters similar to

*Micarea erratica* and probably should be recognized as a distinct species and transferred to *Micarea* when the type is restudied.

*Micarea erratica* in eastern North America often has a well developed, areolate, gray thallus with a black prothallus. When the thallus is poorly developed and the rock is mostly covered with the blackish prothallus, e.g., Cummings Lich. bor.-am. 212, there is some tendency for confusion with the dark brown thallus forms of *L. cyrtidia*. In extreme environments, such as the dwarf pine barrens of New Jersey, the apothecia are borne on a black, dendritic prothallus with only an occasional granule of thallus. My impression is that *M. erratica* prefers open situations, unlike *L. cyrtidia*. The species is well named as it can be found very frequently on non-calcareous glacial erratics and is often the pioneer species on pebbles in old field succession. *Micarea erratica* seems to be more common and more widely distributed than *L. cyrtidia*, with a more northerly range in eastern North America, one collection from California, and is known from Europe and Australia/New Zealand.

**Acknowledgments:** I thank Don Pfister (FH) and Orvo Vitikainen (H) for the expeditious loan of the types involved.

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# A Preliminary Bryophyte Survey of San Felasco Hammock State Preserve with Some Range Extensions for Florida

E. Christine Davis Fleming[1]

San Felasco Hammock State Preserve is in northwestern Alachua County, florida, and is located at approximately N longitude and W latitude. It includes over 2400 hectares and was acquired by the State of Florida in 1974 under Florida's Environmentally Endangered Lands Program. Many community types are represented within the preserve, including cypress swamps, pine sandhills, and xeric, mesic and hydric hammocks. Sinkholes, ponds, and spring-fed streams occur in several places throughout the preserve. This ecological variation provides a unique site for study, but to date there has been no other study of the bryophytes in the preserve.

This study concentrated on the extreme southern portion of the preserve, consisting of four major community types: 1)sandhill, canopy containing only *Pinus palustris* and *Quercus laevis*; 2)xeric hammock, dominated by the sandhill species, with *Magnolia grandiflora*, *Myrica cerifera*, and *Vitis rotundifolia* (in general, xeric hammock is transitional between sandhill and mesic hammock); 3)mesic hammock, canopy dominated by *Quercus nigra*, *Quercus virginiana*, *Liquidambar styraciflua*, *Carya glabra*, and *Magnolia grandiflora*, with a mid-story containing *Ostrya virginiana* and *Persea borbonia*; and 4)hydric hammock, canopy resembles that of the mesic hammock, with the addition of *Carpinus caroliniana* and *Ilex opaca* as dominant species. This southern portion of the preserve slopes downward as the communities progress, with the sandhill being the highest part of the slope. The hydric hammock has the lowest elevation of the four communities, and contains sinkholes, seeps and small ponds. The sandhill and xeric hammocks have the lowest moisture availability with greatest sunlight penetration to the forest floor, and the hydric hammock has the highest moisture availability with low sunlight penetration to the forest floor. For a more complete description of the plant communities of the preserve, see William Dunn's dissertation "Plant Communities and Vascular Flora of San Felasco Hammock, Alachua County, Florida" (1982).

---

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In each of the community types, three $9m^2$ plots were randomly placed with a distance of at least 20m between plots. Samples of bryophytes contained in each plot were taken, including any found on the ground, on fallen branches, and up to 1.8m on tree trunks. A seep found in the hydric hammock was included as a separate moisture regime and three plots in it were sampled. Specimens were identified using Rudolf Schuster's guides (1969,1974,1980,1992), Ruth Breen's key to the mosses of Florida (1963) and David Breil's key for liverworts (1970). Specimens were verified by Dr. Dana Griffin, III and vouchers are deposited in the FLAS Bryophyte Herbarium at the University of Florida.

As expected, based on bryophytes' preference for moist microhabitats, the greatest species richness was found in the hydric hammock and the lowest species richness was in the sandhill (Table 1). Species richness gradually increased as the plots progressed to moister communities, as the ground sloped downward. Twenty-four liverwort species and 25 moss species were collected. In each area, richness of mosses and liverworts was roughly equal, with the exception of the sandhill and xeric hammock areas in which there were more liverworts than mosses.

The seep contained many moss and liverwort species which were restricted to water saturated microhabitats in this study (Table 1). *Acrolejeunea heterophylla* was restricted to the dryest, sunniest areas. In the sandhill and xeric hammock, most bryophytes were restricted to extreme bases of tree trunks. Most specimens in these xeric communities were found growing at the base of *Q. laevis*, and rarely on *P. palustris*. In the mesic and hydric hammocks, bryophytes were sometimes found growing high up on the trunks of trees (e.g. *Forsstroemia trichomitria*) but the majority of specimens were found at the base of trunks. *Leucodon julaceus* and *Frullania ericoides* were found only on fallen branches, perhaps indicating that these species are more likely to be found in the canopy.

The majority of moss species found are considered to be subtropical to tropical, with a few species that are found in temperate areas, and a few that are nearly circumpolar (Crum and Anderson 1981). Similarly, most of the liverworts are described as subtropical to tropical species, with a few temperate species and a few nearly circumpolar species (1969,1974,1980,1992). It is probable that many more species will be found in other parts of the preserve (other community types, and in the canopy) with further investigation.

Of the moss specimens collected, *Fissidens donnellii*, *Forsstroemia trichomitria*, *Herpetineuron toccoae*, and *Fabronia ravenellii* are not reported in the literature as being found in Alachua County. *Forsstroemia trichomitria* and *F. ravenellii*'s ommissions are probably due to lack of collection rather than range extensions. *Fissidens donnellii* was previously reported in Florida from Monroe and Seminole Counties only. *Herpetineuron toccoae* was previously reported in Florida from Hernando, Polk, and Wakulla Counties only, and is described as uncommon (1963).

Of the liverwort specimens collected, only *Cololejeunea minutissima ssp. minutissima* and *Plagiochila undata* were listed in the literature as being previously recorded in Alachua County. Again, this reflects a lack of collecting in the county rather than range extensions. A notable exception is *Acrolejeunea heterophylla*. Previously, *A. heterophylla*'s entire range was considered to be limited to Central America and Lake, Marion, Hillsborough, Sanford and Seminole counties in Florida (1969, 1974, 1980, 1992).

## New Records for Alachua County

*Acrolejeunea heterophylla* (Evans) Grolle & Gradst. Fleming 9701, 9702 (FLAS).

*Herpetineuron toccoae* (Sull. & Lesq. ex Sull.) Card. Fleming 9710 (FLAS).

*Fissidens donnellii* Aust. Fleming 9706 (FLAS).

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| Name of Bryophyte | Sandhill | Xeric hammock | Mesic hammock | Hydric hammock | Seep |
|---|---|---|---|---|---|
| **MOSSES** | | | | | |
| | | | | | |
| *Isopterygium tenerum* (Sw.) Mitt. | X | X | | X | X |
| *Sematophyllum adnatum* (Michx.) Britt | X | X | X | X | X |
| *Anomodon attenuatus* (Hedw.) Hueb. | | | X | X | X |
| *Entodon macropodus* (Hedw.) C. Muell. | | | X | X | X |
| *Fissidens donnellii* Aust. | | | X | X | X |
| *Amblystegium serpens* (Hedw.) B.S.G. | | | X | X | |
| *Cryphaea glomerata* B.S.G. ex Sull. | | | X | X | |
| *Forsstroemia trichomitria* (Hedw.) Lindb. | | | X | X | |
| *Herpetineuron toccoae* (Sull. & Lesq.ex Sull.) Card. | | | X | | |
| *Schwetschkeopsis fabronia* (Schwaegr.) Broth. | | | | X | X |
| *Thuidium delicatulum* (Hedw.) B.S.G. | | | | X | X |
| *Entodon seductrix* (Hedw.) C. Muell. | | | | X | |
| *Fabronia ravenellii* Sull. | | | | X | |
| *Leucodon julaceus* (Hedw.) Sull. | | | | X | |
| *Papillaria nigrescens* (Hedw.) Jaeg. & Sauerb. | | | | X | |
| *Pireella pohlii* (Schwwaegr.) Card. | | | | X | |
| *Thelia hirtella* (Hedw.) Sull. | | | | X | |
| *Atrichum angustatum* (Brid.) B.S.G. | | | | | X |
| *Fissidens taxifolius* Hedw. | | | | | X |
| *Leucobryum albidum* (Brid. ex P.-Beauv.) Lindb. | | | | | X |
| *Mnium affine* Bland ex Funck var. *ciliare* C.M. | | | | | X |
| *Mnium cuspidatum* Hedw. | | | | | X |
| *Rhizogonium spiniforme* (Hedw.) Bruch ex Kraus | | | | | X |
| *Rynchostegium serrulatum* (Hedw.) Jaeg. & Sauerb. | | | | | X |

Table 1. Cumulative species and respective plant communities in which they were found.

| Name of Bryophyte | Sandhill | Xeric hammock | Mesic hammock | Hydric hammock | Seep |
|---|---|---|---|---|---|
| **LIVERWORTS** | | | | | |
| *crolejeunea heterophylla* (Evans) Grolle & Gradst. | X | X | | | |
| *Cheilolejeunea myriantha* (Nees & Mont.) Schust. | X | | | X | |
| *Frullania kunzei* Lehm. et Lindenb. | X | X | | X | |
| *Leucolejeunea conchifolia* Evans | X | X | | X | X |
| *Frullania obcordata* Lehm. et Lindenb. | | X | | X | X |
| *Lejeunea flava* (Sw.) Nees | | X | X | X | X |
| *Leucolejeunea unciloba* (Lindenb.) Evans | | | X | X | |
| *Cololejeunea minutissima* Schiffn. ssp. *myriocarpa* (Nees et Mont.) Schust. | | | X | X | X |
| *Frullania eboracensis* Gott. | | | X | X | X |
| *Plagiochila miradorensis* Gott. | | | X | X | X |
| *Radula australis* Aust. | | | X | X | X |
| *Metzgeria furcata* (L.) Dum. | | | | X | X |
| *Cololejeunea minutissima* ssp. *minutissima* (Sm.) Schiffn. | | | | X | |
| *Frullania ericoides* Mont. | | | | X | |
| *Mastigolejeunea auriculata* (Wils. et Hook) Schiffn. | | | | X | |
| *Plagiochila ludoviciana* Sull. | | | | X | |
| *Calypogeia fissa* (L.) Raddi ssp. *neogaea* Schust. | | | | | X |
| *Cheilolejeunea rigidula* (Nees et Mont.) Schust. | | | | | X |
| *Dumortiera hirsuta* (Sw.) Nees | | | | | X |
| *Lejeunea cladogyna* Evans | | | | | X |
| *Lophocolea martiana* Nees | | | | | X |
| *Pallavacinia lyellii* (Hook.) Carruth. | | | | | X |
| *Plagiochila undata* (Sull.) ssp. *crispata* (Gott.) Schust. | | | | | X |
| *Riccardia palmata* (Hedw.) Carruth. | | | | | X |

Table 1. Cumulative species and respective plant communities in which they were found.

# Mosses from Disturbed Sites of Forest Reserves of the North Coast Limestone Area of Puerto Rico

Yolanda Serrano[1]

**Abstract**. *This study is to identifies the mosses that appear in disturbed sites of five forest reserves of the north coast limestone area of Puerto Rico. Thirty-three species in 26 genera were found. Five species show a wide distribution. The number of species found in disturbed sites of the forest reserves varies from 9 species at Tortuguero and Cambalache to 19 species at Guajataca. The families with the greatest number of species are Fissidentaceae (6 species)and Hypnaceae (5 species). Pleurocarpus species represent from 59 to 87% of this flora in the 5 areas. Sporophytes were observed in 14 (42.4%) species and in all the species found in 4 or more forest reserves.*

The north coast limestone area of Puerto Rico has been subjected to ecological degradation and today much of this area has been lost to urbanization. The remaining area is covered mainly by secondary vegetation; nevertheless, in addition to the forest reserves some sites serve as habitat for endemic, rare and endangered species (U.S. Fish and Wildlife Service 1987a, b, 1994).

This area has been deforested at one time or another, primarily for use in agriculture. The limestone zone extends from the northeast to the northwest coast of the island and the elevation from sea level to 500 m. This area is characterized by subconical limestones mounds called "mogotes". These show steep cliff walls that arise vertically from the ground. All "mogotes" are covered by dense layer of calcareous rocks that vary from several cm to 10 m in thickness. Crum and Steere (1957) reported a great number of species from the limestone area, based primarily in the collections made by Steere in 1939-1940. No previous study has been made in these disturbed sites.

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## METHODS

Mosses were collected between September-December, 1992 in the following forest reserves: Cambalache, Guajataca, Río Abajo, Tortuguero and Vega. All collections were made along the major trails of the forest reserves. A total length of 2,000 m of transect line was surveyed. Quadrats of 1 $m^2$ were studied on or near the margin of the trail at every 100 m. Twenty quadrants in each forest reserve were studied. All specimens used in this study are in my personal collection.

## STUDY AREAS

All forest reserves belong to the karst zone (distinguished by "mogote" hills) located in the north coast area of Puerto Rico and to the subtropical moist zone (Ewel & Whitmore 1973). In addition, Río Abajo Forest was chosen to represent a subtropical wet zone. Endemic, rare and endangered plant and animal species are found in every forest (Liogier & Martorell, 1982: Little et al, 1974; Little et al, 1977).

1) Cambalache Forest Reserve has an area of 3.8 $km^2$ and an elevation ranging from 5 to 50 m. The entire forest lies in the Municipalities of Barceloneta and Arecibo between 18°26' and 18°28'N and 66°42' and 66°46'W. A mean annual rainfall of 150 cm and a mean annual temperature of 25°C is observed in this forest. Little of the natural vegetation remains in the narrow bottomlands between the "mogotes". At present the vegetation of the forest is dominated by *Tectonia grandis* (teak) or secondary forest growth (Department of Natural Resources, 1976).

2) Guajataca Forest Reserve has an area of 9.4 $km^2$ and an elevation ranging from 150 to 300 m. The entire forest lies in the Municipality of Isabela between 18°24' and 18°26'N and 67°00' and 66°50'W. A mean annual rainfall of 190 cm and a mean annual temperature of 25°C is observed in this forest. A large portion of this forest has been previously cultivated or disturbed; today large areas are planted with *Anthocephalus cadamba* (kadam), *Callophyllum calaba*, and *Daphnopsis americana* (mohoe) (Department of Natural Resources, 1976).

3) Río Abajo Forest Reserve has an area of 23.1 km$^2$ and an elevation ranging from 200 to 425 m. The forest lies in the Municipalities of Utuado and Arecibo between 18°18' and 18°21'N and 66°41' and 66°43'W. A mean annual rainfall of 200 cm and a mean annual temperature of 26°C is observed here. Much of this is successional vegetation. During 1936-38 large areas were planted with *Callophyllum brasilense* and *Swietenia mahogani.* In 1962 *Pinus caribaea* (Honduran pine), *Daphnopsis americana, Tectonia grandis, Anthocephalus cadamba* and *Swietenia macrophylla* (Honduran mahogany) were planted (Department of Natural Resources, 1976).

4) Tortuguero Forest Reserve has an area of 2.43 km$^2$ and an elevation ranging from 5 to 50 m. In addition to "mogote" hills consists of sandstone silica, swamps and the only natural lagoon of Puerto Rico. The forest lies in the Municipalities of Vega Baja and Manatí (Department of Natural Resources, 1976). Collections were made only in the area of "mogote" hills at latitude 18°27'10"N and longitude 66°27'50"W.

5) Vega Forest Reserve has an area of 4.6 km$^2$ and an elevation ranging from 5 to 50 m. The forest lies in the Municipalities of Vega Alta and Vega Baja between 18°25' and 18°23'N and 66°19' and 66°21'W. A mean annual rainfall of 170 cm and a mean annual temperature of 26°C is observed in this forest. Little of the natural vegetation remains. Part of the area has been planted with *Tectonia grandis* (Department of Natural Resources, 1976).

## RESULTS

Thirty tree species in 26 genera were collected in the disturbed sites of the five forest reserves(Table 1). Fifteen species (45.5%) were found in only one forest reserve (Table 1), of these 12 were not previously reported for that particular forest (Crum & Steere, 1957; Sastre-D.J. & Buck, 1993*). Barbula agraria, Chryso-hypnum diminutivum, Taxithelium planum* and *Cyrto-hypnum involvens* were found in 4 forest reserves. The first 3 were previously reported in one particular forest, while the last one has not been reported previously in any forest reserves visited in this study. *Sematophyllum subpinnatum* was the only moss observed in all study sites. The number of species found in disturbed sites of the forest reserves was: Cambalache, 9 species; Guajataca, 19 species; Río Abajo, 15 species; Tortuguero, 9 species and Vega, 12 species.

Sporophytes were observed in 14 species (42.4%) (Table 1). All widespread species found in 4 or more forest reserves produce sporophytes. Except for *Taxiphyllum taxirameum* species found in only one forest reserve did not have sporophytes.

## DISCUSSION

There have been 284 moss species in 120 genera reported for Puerto Rico (Sastre-D.J. & Buck 1993); of these 31 have not been found recently on the island since reports were made between 1885 and 1982. Approximately 20% of those species found on Puerto Rico occur only in unprotected areas (Sastre-D.J. & Tan 1995).

The forest reserves of the north coast limestone area have been subjected to ecological disturbance. Tortuguero Forest Reserve has been subjected to illegal garbage deposition and uncontrolled grazing practice. This has been the cause of the recent loss of two *Sphagnum* species (Sastre-D.J. & Tan 1995). Cambalache and Vega Forest have lost part of their reserve area due to the construction of a highway. Also Río Abajo Forest has been affected by the expansion and construction of several roads.

Earlier, Serrano (1996) conducted a study of mosses present in disturbed sites in the Municipality of Bayamón.The families with the greatest number of species in this municipality located Km.E from the present study area were Fissidentaceae with 9 species, Hypnaceae, Pottiaceae and Callicostaceae, with 3 each. These were also the families with the greatest number of species in disturbed sites of the forest reserves of the north coast limestones area, with Fissidentaceae having 6 species, Hypnaceae 5 species and Pottiaceae 4 species.

In this study 17 species (51.5%) are common to those found in Bayamón; of these *B. agraria, C. diminutivum, T. planum, Vesicularia vesicularis* and *S. subpinnatum* were observed in at least 3 or more forest reserves and are widely distributed throughout the Bayamón municipality. All these species (except *C. diminutivum* in Bayamón) were observed with sporophytes in both studies. On the other hand, *Cyrto-hypnum involvens* which was observed in 4 forest reserves, is the only species not found in disturbed sites of Bayamón. It was surprising to find *Fissidens zollingeri* in disturbed sites in only 2 forest reserves, because this species showed the greatest number of collections in Bayamón, and also is common in disturbed limestone mounds of the north coast area of the island.

Thirteen species found in this study were reported by Crum & Steere (1957) to have a widespread distribution based on collections made between 1939-40. Of these only *B. agraria* and *T. planum* were found in disturbed sites of 4 forest reserves.

According to Breene (1953) the following six moss species occurred in Puerto Rico on limestone, *B. agraria, T. jamaicense, S. prolifer* (all these 3 were found in this study), *Hypoterygium tamariscinum* (recently recollected in Camuy by Sastre-D.J. & Buck 1993), *Gymnostomiella orcutti* (recently found again in Río Abajo by Redfearn 1991) and *Luisierella barbula*. This last one is included in the list of species not found in Puerto Rico since their original collection (Sastre-D.J. & Santiago-Valentín, in press).

The % of pleurocarpus species was greater than acrocarpus species in disturbed sites of the different forest reserves studied. The % of pleurocarpus species varies from 60% to 67% in all forest reserves that belong to the subtropical moist zone. Meanwhile in Río Abajo Forest 87% of the species present in disturbed sites were pleurocarpus.

An important factor for moss dispersal capacity and therefore the colonization of new localities is the production of spores. Sporophytes were observed in 14 (42.4%) species and includes all species found in 4 or more forest reserves. It was observed that all species with sporophytes (except *T. taxirameum*) were found in more than one forest reserves. The following species were observed with sporophytes in this study and in disturbed sites of the Municipality of Bayamón: *B. agraria, F. zollingeri, P.gracillima, S. Subpinnatum, T. Planum* and *V. Vesicularis*. All these were found in 2 or more forest reerves and 4 or more study sites in Bayamón.

Sastre-D.J. and Tan (1995) stated that species are being affected by disturbance in forest reserves. This study can help to identify what species can colonize and survive in disturbed areas of the forests in addition to those that have been introduced to these areas.

In conclusion, these records tell us that disturbance is apparently favouring the appearance of some species in Puerto Rico like *S. subpinnatum, T. planum, C. diminutivum, C. involvens* and others. Meanwhile the study of disturbed sites in forest reserves in addition to non disturbed areas will give us information of how moss species can tolerate or not tolerate disturbance in this habitats.

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Table 1. Mosses found in disturbed sites of forest reserves of the north coast limestone area of Puerto Rico. The following refers to forest reserves visited C=Cambalache, G=Guajataca, R=Río Abajo, T=Tortuguero, V=Vega. (X= previously reported, *= not previously reported). The numbers in parentheses represent the collection number. An S in the last column indicates presence of sporophytes.

| Species | C | G | R | T | V | S |
|---|---|---|---|---|---|---|
| *Barbula agraria* Hedw. (950,987,1026,1054) | * | X | * |  | * | S |
| *Brachythecium stereopoma* (Spruce) Jaeg. (1039) |  |  | * |  |  |  |
| *Brymela* cf. *fissidentoides* (Hook. f. & Wils.) Buck (994) |  | * |  |  |  |  |
| *Bryum apiculatum* Schwaegr. (1006) |  | * |  |  |  |  |
| *Calymperes afzelli* Sw. (933,1051) |  |  |  | X | * |  |
| *Chryso-hypnum diminutivum* (Hampe) Buck (970,943,1056) | * | X |  | * | * | S |
| *Cyrto-hypnum involvens* (Hedw.) Buck & Crum (952,1047,935) | * | * | * | * |  | S |
| *Ectropothecium leptochaeton* (Schwaegr.) Buck (993,1022) |  | * | X |  |  | S |
| *Entodon macropodus* (Hedw.) C. Müll (915,1035) |  | X | X |  |  | S |
| *Entodontopsis leucostega* (Brid.) Buck & Ireland (960,939) | * |  |  | * |  |  |
| *Fissidens elegans* Brid. (1005) |  | * |  |  |  |  |
| *Fissidens guianensis* Mont. (937) |  |  |  | * |  |  |
| *Fissidens oblongifolius* Hook. f. & Wils. (1008,1029,1053) |  | * | * |  | * | S |
| *Fissidens santa-clarensis* Thér. (962,989) | * | * |  |  |  | S |
| *Fissidens serratus* C. Mueller (1056) |  |  |  |  | * |  |
| *Fissidens zollingeri* Mont. (949) |  | * |  | * |  | S |
| *Haplocladium microphyllum* (Hedw.) Broth. (1064) |  |  |  |  | * |  |
| *Isopterygium tenerum* (Sw.) Mitt. (997,1051) |  | * |  |  | * |  |
| *Neckeropsis disticha* (Hedw.) Kindb. (1045,1062) |  |  |  |  | * |  |
| *Neckeropsis undulata* (Hedw.) Reich. (932) |  |  |  | * |  |  |
| *Octoblepharum albidum* Hedw. (958) | * |  |  |  |  |  |

| Species | C | G | R | T | V | S |
|---|---|---|---|---|---|---|
| *Papillaria nigrescens* (Hedw.) Jaeg. (1004,1034) |  | X | * |  |  |  |
| *Philonotis gracillima* Ångstr. (1007,1030) |  | * | * |  |  | S |
| *Sematophyllum subpinnatum* (Brid.) Britt. (964,998,1032,936,1050) | * | X | X | X | * | S |
| *Syrrhopodon incompletus* Schwaegr. var. *incompletus* (1028) |  |  | * |  |  |  |
| *Syrrhopodon prolifer* var. *scaber* (C. Müll.) Reese (992) |  | X |  |  |  |  |
| *Taxiphyllum taxirameum* (Mitt.) Fleisch. (1021) |  |  | X |  |  | S |
| *Taxithelium planum* (Brid.) Mitt. (954,1046,940,1049) | * |  | X | * | * | S |
| *Thuidium urceolatum* Lor. (988) |  | * |  |  |  |  |
| *Trichostomum jamaicense* (Mitt.) Jaeg. (1009,1065) |  | X |  |  | * | S |
| *Vesicularia vesicularis* (Schwaegr.) Broth. (985,1049,1063) |  | * | X |  | * | S |
| *Weissia breutelii* C. Müll (1020) |  |  | * |  |  |  |
| *Weissiodicranum insularum* Reese (951) | X |  |  |  |  |  |
| Total of species | 9 | 19 | 15 | 9 | 12 | 14 |

# Checklist of the Liverworts and Hornworts of the Interior Highlands of North America in Arkansas, Illinois, Missouri, and Oklahoma.

Stephen L. Timme[1] and Paul L. Redfearn, Jr.[2]

The below checklist is the result of numerous collectors, but primarily the many years of field work in the Interior Highlands by the second author. All collections forming the basis of this checklist have been examined through field and herbarium studies by the first author unless the locality cited is followed by a literature citation in parenthesis. Recent collections not seen by the authors have been added and are indicated by the collector's name in parenthesis. The checklist is incomplete but will serve as a basis for the distribution of liverworts and hornworts in the Interior Highlands, and as a basis for future studies and reference. Counties located in the Interior Highlands are divided into approximate geographic regions, i.e., the Salem Plateau (**Salem Plateau**), the Springfield Plateau (**Springfield Plateau**), the St. Francois Mountains (**St Francois Mts**), the Ozark Hills (**Ozark Hills**), the Boston Mountains (**Boston Mts**), the Arkansas Valley (**Arkansas Valley**), and the Ouachita Mountains (**Ouahita Mts**). Counties in Arkansas, Illinois, or Oklahoma are followed by their state abbreviation. Counties not followed by their state abbreviation are located in Missouri. The distribution of taxa in areas immediately adjacent to the Interior Highlands, the Unglaciated Prairie (**Prairie**), Border Counties (**Border Counties**) north of the Missouri River, the Mississippi Lowlands (**Mississippi Lowlands**), and the Coastal Plain (**Coastal Plain**), are also noted (see Redfearn 1972 for an overview and map of the Interior Highlands). Literature citations for specimens not seen by the authors are included in the Literature Cited followed by additional literature pertaining to the liverwort and hornwort flora of the Interior Highlands. Voucher specimens, or references to herbaria where voucher specimens are deposited, are filed under the taxon in the bryophyte collections at the Ozark Regional Herbarium, Southwest Missouri State University (SMS) or The Missouri Botanical Garden (MO). Specimens

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deposited in other herbaria are parenthetical following the county. They include DUKE (Duke University), KSP (Pittsburg State University), SIU (Southern Illinois University), UARK (University of Arkansas, Fayetteville), and UMO (University of Missouri, Columbia). Except where noted, nomenclature and the arrangement of families follows Stotler and Crandall-Stotler (1977). The below checklist can be accessed through the Southwest Missouri State University's Ozark Regional Herbarium web site at science.smsu.edu/~csre/ herbarium/ liverw_t.htm.

Within the Interior Highlands 109 species of liverworts representing 26 families and five species of hornworts in one family are known. Twenty percent (23/114) of the flora is restricted to a single locality. This may indicate the lack of collecting or they may truly be restricted to these sites. Certainly more intense collecting is needed to fully understand the species present and their distribution within the Interior Highlands.

## HEPATOPHYTA

### PTILIDIACEAE

*Ptilidium pulcherrimum* (G. Web.) Hampe **Salem Plateau**: Phelps.

*Trichocolea tomentella* (Ehrh.) Dum. **Springfield Plateau**: Benton-AR (UARK); **Salem Plateau**: Camden, Carter (KSP), Dent, Howell (F), Marion (UARK), Ste. Genevieve, Shannon, Texas; **Boston Mts**: Pope (Duke); **Arkansas Valley**: Sebastian-AR (UARK); **Ouahita Mts**: Garland, Montgomery (DUKE), Polk-AR (UARK); **Ozark Hills**: Jackson (SIU).

### LEPIDOZIACEAE

*Kurzia setacea* (Web.) Grolle **Boston Mts**: Newton-AR.

*Kurzia sylvatica* (Evans) Grolle **Salem Plateau**: Ste. Genevieve.

*Telaranea nematodes (Gott. ex Aust.) M. A. Howe* **Coastal Plain**: Hempstead-AR (UARK); **Boston Mts**: Franklin-AR (UARK).

*Bazzania trilobata* (L.) S. Gray var. *trilobata* **Salem Plateau**: Ste. Genevieve, Madison-AR; **Springfield Plateau**: Dade (KSP).

### CALYPOGEIACEAE

*Calypogeia fissa* (L.) Raddi *senso stricto* **Ouahita Mts**: Scott-AR.

*Calypogeia fissa* subsp. *neogaea* Schust. **Salem Plateau**: Shannon (KSP), Ste. Genevieve, Stone; **Boston Mts**: Newton-AR (KSP).

*Calypogeia muelleriana* subsp. *blomquistii* Schust. **Ouahita Mts**: Polk-AR (DUKE).

*Calypogeia sullivantii* Aust. **Salem Plateau**: Ste. Genevieve; **Boston Mts**: Franklin-AR (UARK); **Ouahita Mts**: Hempstead-AR (UARK), Montgomery-AR (UARK); Polk-AR.

*Calypogeia trichomanis* (L.) Corda **Springfield Plateau**: St. Clair; **Salem Plateau**: Izard-AR (UARK), Jefferson, Madison-AR (UARK); **Boston Mts**: Faulkner-AR (UARK), Van Buren-AR (UARK), Washington-AR (UARK); **Ouahita Mts**: Polk-AR (UARK); **Mississippi Lowlands**: St. Francis-AR (UARK); **Ozark Hills**: Union.

## CEPHALOZIACEAE

*Cephalozia biscupidata* (L.) Dumort. subsp. *biscupidata* **Ozark Hills**: Jackson-IL (Hatcher, 1952).

*Cephalozia lunulifolia* (Dum.) Dum. **Salem Plateau**: Ste. Genevieve; **Boston Mts**: Newton-AR; **Prairie**: Barton (KSP).

*Nowellia curvifolia* (Dicks.) Mitt. **Salem Plateau**: Carter (KSP), Shannon (UMO), Ste. Genevieve; **Boston Mts**: Johnson-AR, Newton-AR; **Boston Mts**: Polk-AR (DUKE).

## ADELANTHACEAE

*Odontoschisma denudatum* (Nees ex Mart.) Dum. *var. denudatum* **Salem Plateau**: Madison-AR; **Boston Mts**: Newton-AR; **Ouahita Mts**: Saline-AR.

*Odontoschisma prostratum* (Sw.) Trev. **Salem Plateau**: Baxter-AR, Ste. Genevieve, Stone-AR; **Boston Mts**: Conway-AR, Franklin-AR, Newton-AR.

## CEPHALOZIELLACEAE

*Cephaloziella divaricata* (Sm.) Schiffn. var. *divaricata* **Salem Plateau**: Franklin, Ste. Genevieve, Stone-AR; **Boston Mts**: Conway-AR.

*Cephaloziella hyalina* Douin **Salem Plateau**: Stone-AR (Schuster-1980); **Boston Mts**: Newton-AR (KSP).

*Cephaloziella rubella* (Nees) Warnst. var. *rubella* **Springfield Plateau**: Barry (KSP), Newton (KSP); **Salem Plateau**: Shannon (KSP).

## GEOCALYCACEAE

*Geocalyx graveolens* (Schrad.) Nees **Salem Plateau**: Ste. Genevieve; **Boston Mts**: Searcy-AR.

## LOPHOCOLEACEAE

Nomenclature follows Engel, J. J. and R. M. Schuster (1984).

*Chiloscyphus bidentata* (L.) Eng. & Schuster **Salem Plateau**: Carter (KSP), Ste. Genevieve; **Boston Mts**: Crawford-Ar, Newton-AR, Searcy-Ar.

*Chiloscyphus cuspidata* (Nees) Eng. & Schust. **Salem Plateau**: Carter (KSP), Delaware-OK, Madison-AR, Shannon (DUKE); **St. Francois Mts**: Reynolds.

*Chiloscyphus pallescens* (Ehrh. ex Hoffm.) Dum. var. *pallascens* **Salem Plateau**: Montgomery (Darigo).

*Chiloscyphus profundus* (Nees) Eng. & Schust. **Springfield Plateau**: Benton; **Salem Plateau**: Camden, Carter (DUKE), Franklin, Oregon, Shannon (KSP), St. Francis, Ste. Genevieve, Stoddard (DUKE), Stone-AR (UARK), Washington-AR (UARK); **Boston Mts**: Faulkner-AR (UARK), Van Buren-AR (UARK): **Ouahita Mts**: Garland-AR (UARK), Montgomery-AR (UARK), Polk-AR (UARK), Yell-AR (UARK). **Prairie**: Barton (KSP).

## PLAGIOCHILACEAE

*Plagiochila acanthophylla* subsp. *japonica* var. *ciliigera* (Schust.) H. Inoue **Salem Plateau**: Stone-AR.

*Plagiochila asplenioides* subp. *porelloides* (Torrey ex Nees) Schust. **Salem Plateau**: Benton-AR (UARK), (KSP), Franklin, Madison-AR (DUKE), Marion-AR (Schuster, 1980), Shannon, Ste. Genevieve; **Boston Mts**: Crawford-AR (DUKE), Franklin-AR (DUKE), Newton-AR (DUKE), Pope-AR (DUKE), Washington-AR (DUKE); **Ouahita Mts**: Polk-AR (DUKE), Saline-AR (DUKE).

*Plagiochila ludoviciana* Sull. **Arkansas Valley**: Sebastian-AR.

*Plagiochila undata* Sull. subsp. *undata* **Boston Mts**: Franklin-AR (UARK), Newton-AR; **Ouahita Mts**: Montgomery-AR (DUKE); **Arkansas Valley**: Conway-AR (DUKE).

## JUNGERMANNIACEAE

*Lophozia badensis* (Gott. ex Rabenh.) Schiffn. var. *badensis* **Springfield Plateau**: Washington-AR; **St. Francois Mts**: Reynolds.

*Gymnocolea inflata* (Huds.) Dum. var. *inflata* **Ouahita Mts**: Polk-AR.

*Jamesoniella autumnalis* (DC.) Steph. var. *autumnalis* **Springfield Plateau**: Polk; **Salem Plateau**: Shannon, Ste. Genevieve; **Ouahita Mts**: Hot Springs, Montgomery-AR.

*Nardia lescurii* (Aust.) Underw. **Salem Plateau**: Ste. Genevieve.

*Jungermannia crenuliformis* Aust. **Springfield Plateau**: Dade; **Boston Mts**: Franklin-AR (DUKE),Newton-AR, Washington-AR; **Ouahita Mts**: Polk-AR.

*Jungermannia gracillima* Sm. **Prairie**: Barton.

*Jungermannia hyalina* Lyell **Arkansas Valley**: Pope; **Ouahita Mts**: Hot Springs.

*Jungermannia leiantha* Grolle **Ouachita Mts**: Montgomery-AR (DUKE), Scott-AR.

*Jangermannia pumila* With. **Springfield Plateau**: St. Clair.

## GYMNOMITRIACEAE

*Marsupella sphacelata* (Gieseke) Dum. **Salem Plateau**: Ste. Genevieve; **Ouahita Mts**: Montgomery-AR.

## SCAPANIACEAE

*Diplophyllum apiculatum* (Evans) Steph. var. *apiculatum* **Springfield Plateau**: Delaware-OK (Little, 1936); **Salem Plateau**: Ste. Genevieve, **Boston Mts:** Washington-AR (UARK), Franklin-AR (UARK).

*Scapania nemorosa* (L.) Dum. **Springfield Plateau:** Barry, Carroll-AR (UARK); **Salem Plateau**: Camden, Izard-AR (UARK), Jefferson, Shannon (UMO), Stone-AR (DUKE), Ste. Genevieve, Wayne (UMO); **St. Francois Mts**: Iron; **Boston Mts**: Conway-AR (DUKE), Franklin-AR (UARK), Johnson-AR (DUKE), Newton-AR, Pope-AR (DUKE), Van Buren-AR (UARK), Washington-AR (DUKE); **Arkansas Valley**: Faulkner-AR (UARK), **Ouahita Mts**: Clark-AR (UARK), Garland-AR (UARK), Hot Springs-AR, Scott-AR.

*Scapania undulata* (L.) Dum. var. *undulata* **Ouahita Mts**: Pulaski.

## RADULACEAE

*Radula australis* Aust. **Salem Plateau**: Texas.

*Radula complanata* (L.) Dum. **Salem Plateau**: Barry (KSP), Carter (Gier, 1955), Shannon (Gier, 1955), Ste. Genevieve, Stone-AR (DUKE); **Boston Mts**: Conway-AR (DUKE), Johnson-AR, Washington-AR (KSP); **Ouahita Mts**: Polk-AR.

*Radula complanata* subsp. *lindbergiana* (G. ex Hartm.) Schust. **Boston Mts**: Newton (Schuster, 1980-IV), Washington (Schuster, 1980).

*Radula mollis* Lindenb. et Gott. **Salem Plateau**: Baxter-AR (UARK), Johnson-AR (UARK), Marion-AR (Schuster, 1980-IV); **Boston Mts**: Searcy-AR; **Ouahita Mts**: Montgomery-AR (DUKE), Perry-AR.

*Radula obconica* Sull. **Salem Plateau**: Carter (KSP), Marion-AR (Schuster, 1980), Ste. Genevieve; **Boston Mts**: Crawford-AR (DUKE), Newton-AR, Washington-AR (UARK); **Ouahita Mts**: Montgomery-AR (DUKE), Polk-AR (DUKE).

## PORELLACEAE

*Porella pinnata* L. **Springfield Plateau**: Barry, Benton-AR (UARK), Cedar (US), Hickory, Jasper, Newton (KSP, US); **Salem Plateau**: Camden (UMO), Carter (KSP, DUKE), Crawford, Dallas, Franklin (UMO), Fulton-AR (UARK), Laclede, Madison-AR (UARK), Ozark, Ste. Genevieve (Darigo), Shannon (KSP) Stone-AR (DUKE), Ripley, Texas; **St. Francois Mts**: Madison (UMO), Wayne (Schuster, 1980-IV); **Boston Mts**: Independence-AR (UARK), Johnson-AR (UARK), Newton-AR (UARK), Washington-AR (DUKE); **Arkansas Valley**: Conway-AR (DUKE), Faulkner-AR (UARK), Franklin-AR (UARK); **Ouahita Mts**: Garland-AR (UARK), Hot Springs-AR, Montgomery-AR (UARK), Polk-AR (DUKE), Saline-AR (DUKE), Scott-AR (UARK); **Mississippi Lowlands**: Craighead-AR (UARK).

*Porella platyphylla* (L.) Pfeiff. **Springfield Plateau**: Barry; **Salem Plateau**: Boone-AR, Butler, Izard-AR (UARK), Ozark, Shannon (KSP), Sharp-AR (UARK); **St. Francois Mts**: Madison; **Boston Mts**: Conway-AR (DUKE), Faulkner-AR (UARK), Newton-AR (UARK), Washington-AR (UARK); **Arkansas Valley**: Crawford-AR; **Ouahita Mts**: Montgomery-AR (UARK).

*Porella platyphylloidea* (Schwein.) Lindb. **Springfield Plateau**: Barry, Cedar (US); **Salem Plateau**: Camden, Carter (KSP), Hickory, Oregon, Ozark, Phelps, Shannon (DUKE), St. Louis (Schuster, 1980), Ste. Genevieve, Stoddard (DUKE); **St. Francois Mts**: Iron St. Francois (Darigo); **Boston Mts**: Conway-AR (Schuster, 1980-IV); **Ouahita Mts**: Garland-AR (UARK), Polk-AR.

**JUBULACEAE**

*Frullania brittoniae* Evans **Springfield Plateau**: Barry; **Salem Plateau**: Marion-AR (Schuster, 1992-V), Ste. Genevieve, Stone-AR (DUKE); **St. Francois Mts**: Madison (UMO); **Boston Mts**: Franklin-AR (DUKE), Newton-AR (DUKE), Washington-Ar (Schuster, 1992-V).

*Frullania eboracensis* Gott. subsp. *eboracensis* **Springfield Plateau**: Barry (KSP), Cedar (US), Newton (KSP); **Salem Plateau**: Baxter-AR, Camden, Carter (KSP), Independence-AR, Ste. Genevieve, Shannon (KSP), Washington; **Boston Mts**: Faulkner-AR (UARK), Newton-AR (KSP), Van Buren (UARK), Washington-AR (UARK); **Arkansas Valley**: Sebastian-AR; **Prairie**: Barton (KSP); **Coastal Plain**: Clark (UARK).

*Frullania eboracensis* subsp. *virginica* (G.) Schust. **Salem Plateau**: Marion-AR (Schuster, 1992).

*Frullania ericoides* (Nees) Nees (Schuster 1992) **Springfield Plateau**: Barry (KSP), Cedar (US), Polk, Washington-AR (DUKE); **Salem Plateau**: Baxter-AR (UARK), Carter (DUKE), Izard-AR (UARK), Marion-AR (Schuster, 1992), Ste. Genevieve, Shannon (KSP), Carter (KSP), Sharp-AR (UARK), Stone-AR (DUKE), Texas; **Boston Mts**: Cleburne-AR, Crawford-AR, Johnson-AR, Newton-AR (Schuster, 1992-V), Washington-AR (Schuster, 1992-V), Searcy-AR (UARK); **Arkansas Valley**: Perry-AR (UARK), Latimer-OK; **Ouahita Mts**: Garland-AR (UARK), Hempstead-AR (UARK), Montgomery-AR (UARK), Polk-AR (DUKE), Scott-AR (UARK), Yell-AR (UARK); **Mississippi Lowlands**: Poinsett-AR (UARK).

*Frullania inflata* Gott. **Springfield Plateau**: Barry (KSP), Cedar (US); **Salem Plateau**: Boone-AR, Camden, Carter (KSP), Ste. Genevieve, Shannon (KSP); **Boston Mts**: Newton-AR (KSP); **Ouahita Mts**: Scott-AR (DUKE); **Arkansas Valley**: Sequoyah-OK; **Prairie**: Barton.

*Frullania kunzei* Lehm. et Lindenb. **Salem Plateau**: Douglas; **Boston Mts**: Cleburne-AR, Newton-AR (KSP), Washington-AR (KSP); **Ouahita Mts**: Perry-AR.

*Frullania riparia* Hampe ex Lehm. **Springfield Plateau**: Barry (DUKE), Christian; **Salem Plateau**: Camden, Carter (KSP) Ste. Genevieve, Stone-AR (DUKE), Montgomery (Darigo & Darigo), Shannon (KSP); **Boston Mts**: Newton-AR, Washington-AR (Schuster, 1992-V); **Mississippi Lowlands**: Poinsett-AR (UARK).

*Frullania tamarisci* subsp. *asagrayana* (Mont.) Hatt. **Springfield Plateau**: Washington-AR (UARK); **Boston Mts**: Franklin-AR (UARK), Newton-AR (UARK); **Arkansas Valley**: Logan-AR; **Ouahita Mts**: McCurtain-OK, Montgomery-AR (UARK), Polk-AR (UARK); **Arkansas Valley**: Logan-AR (UARK).

*Frullania tamarisci* (L.) Dumort. subsp. *tamarisci* **Ouahita Mts**: Montgomery (Schuster, 1992-V).

*Jubula pennsylvanica* (Steph.) Evans **Springfield Plateau**: Benton-AR (UARK), **Salem Plateau**: Carter (KSP), Franklin, Madison-AR (UARK), Ste. Genevieve, Washington-AR (DUKE); **Boston Mts**: Crawford-AR (DUKE), Faulkner-AR (UARK), Franklin-AR (DUKE), Newton-AR (DUKE), Washington-AR (KSP); **Arkansas Valley**: Conway-AR (UARK), LeFlore-AR (Little, 1936); **Ouahita Mts**: Montgomery-AR (DUKE), Polk-AR (DUKE),

## LEJEUNEACEAE

*Leucolejeunea clypeata* (Schwein.) Evans **Springfield Plateau**: Benton-AR (UARK), Carroll-AR; **Salem Plateau**: Baxter-AR (UARK), Madison-AR (UARK), Marion-AR (UARK), Shannon (KSP), Ste. Genevieve, Wayne (UMO); **Boston Mts**: Franklin-AR (DUKE), Newton-AR (UARK), Pope-AR, Washington-AR (UARK); **Arkansas Valley**: Conway-AR (DUKE), Johnson-AR (UARK); **Ouahita Mts**: Garland-AR (UARK), Hempstead-AR (UARK), McCurtain-OK, Montgomery-AR (DUKE), Polk-AR (UARK), Scott-AR.

*Leucolejeunea unciloba* (Lindenb.) Evans **Salem Plateau**: Oregon; **Ouahita Mts**: Montgomery-AR, Polk-AR (DUKE).

*Rectolejeunea maxonii* Evans **Salem Plateau**: Carter; **Ouahita Mts**: Montgomery-AR (Schuster, 1980).

*Lejeunea flava* (Sw.) Nees subsp. *flava* **Ouahita Mts**: Montgomery-AR (DUKE).

*Lejeunea laetivirens* Nees et Mont. **Boston Mts**: Johnson-AR; **Ouahita Mts**: Montgomery-AR (DUKE).

*Lejeunea lamacerina* (Steph.) Schiffn. subsp. *gemminata* Schust. **Boston Mts**: Newton-AR.

*Cololejeunea biddlecomiae* (Aust.) Evans **Springfield Plateau**: Christian; **Salem Plateau**: Dallas, Madison-AR (UARK), Marion-AR (Schuster, 1980), Shannon (KSP), Ste. Genevieve; **Boston Mts**:

Independence-AR, Newton-AR, Washington-AR (KSP); **Arkansas Valley**: Franklin-AR (UARK).

### CODONIACEAE

*Fossombronia brasiliensis* Steph. **Salem Plateau**: Baxter-AR, Stone-AR; **St. Francois Mts**: Iron; **Coastal Plain**: Jefferson (Schuster, 1992).

*Fossombronia foveolata* Lindb. **Salem Plateau**: Izard-AR (UARK); **Prairie**: Barton.

*Fossombronia texana* Lindb. **Salem Plateau**: Baxter (DUKE); **Boston Mts**: Newton-AR (DUKE).

### PALLAVICINIACEAE

*Pallavicinia lyellii* (Hook.) Carruth. **Salem Plateau**: Baxter-AR (UARK), Ste. Genevieve, Stone-AR (DUKE); **Boston Mts**: Newton-AR (KSP), Van Buren-AR (UARK); **Arkansas Valley**: Conway-AR (UARK), Franklin-AR (UARK), Pulaski-AR (UARK); **Ouahita Mts**: Garland-AR (UARK), Montgomery-AR (UARK), Polk-AR (UARK), Saline-AR (UARK); **Mississippi Lowlands**: Cross-AR (UARK), Greene-AR (UARK); **Coastal Plain**: Little River-AR (UARK), Nevada-AR (UARK).

### PELLIACEAE

*Pellia endiviifolia* (Dicks.) Dum. **Salem Plateau**: Ste. Genevieve; **Boston Mts**: Crawford-AR, Johnson-AR.

*Pellia epiphylla* (L.) Corda **Salem Plateau**: Ste. Genevieve (Gier, 1955); **Springfield Plateau**: Benton-AR (UARK), Greene (Schuster, 1992); **Boston Mts**: Franklin-AR (UARK), Pope-AR, Washington-AR (KSP); **Ouahita Mts**: Garland-AR (UARK), Montgomery-AR (UARK).

### METZGERIACEAE

*Metzgeria conjugata* Lindb. **Springfield Plateau**: Benton-AR (UARK); **Salem Plateau**: Madison-AR (UARK), Ste. Genevieve, Wayne (UMO); **St. Francois Mts**: Reynolds; **Boston Mts**: Newton-AR (UARK); Washington-AR (Schuster, 1992); **Ouahita Mts**: Polk-AR (DUKE), Pulaski-AR (UARK).

*Metzgeria furcata* (L.) Dum. var. *furcata* **Salem Plateau**: Carter (KSP); **St. Francois Mts**: Madison; **Boston Mts**: Boston-AR (UARK), Newton-AR, Washington-AR (UARK); **Arkansas Valley**: Leflore-OK, Logan-AR (UARK); **Ouahita Mts**: Garland-AR (UARK), McCurtain-OK (Schuster, 1992), Montgomery-AR (UARK).

*Metzgeria furcata* var. *ulvula* Nees **Boston Mts**: Washington-AR (KSP).

*Metzgeria myriopoda* Lindb. **Arkansas Valley**: Pope-AR (Schuster, 1992); **Ouahita Mts**: Montgomery-AR (DUKE), Polk-AR (DUKE).

## ANEURACEAE

*Aneura pinguis* (L.) Dum. **Springfield Plateau**; Benton-AR (UARK); **Salem Plateau**: Carter (KSP), Madison-AR (UARK), Shannon (KSP); **Boston Mts**: Conway-AR (UARK), Newton-AR, Washington-AR (UARK); **Ouahita Mts**: Clark-AR (UARK), Garland-AR, Pulaski-AR (UARK); **Mississippi Lowlands**: Crittenden-AR (UARK), Greene-AR (UARK), St. Francis-AR (UARK).

*Riccardia chamedryfolia* (With.) Grolle **Ouahita Mts**: Garland-AR, Montgomery-AR, Polk-AR (DUKE).

*Riccardia multifida* (L.) S. Gray var. *multifida* **Salem Plateau**: Ste. Genevieve, Carter (KSP); **Boston Mts**: Johnson-AR; **Ouahita Mts**: Montgomery-AR, Polk-AR.

*Riccardia latifrons* (Lindb.) Lindb. **Salem Plateau**: Marion-AR (UARK), Stone-AR (UARK); **Boston Mts**: Crawford-AR (UARK), Franklin-AR (UARK), Johnson-AR (UaRK), Washington-AR (UARK); **Ouahita Mts**: Garland-AR (UARK), Montgomery-AR (DUKE).

*Riccardia palmata* (Hedw.) Carruth. **Salem Plateau**: Stoddard; **Ouahita Mts**: Pulaski-AR (UARK).

## SPHAROCARPACEAE

*Sphaerocarpos texanus* Aust. **Springfield Plateau**: Benton-AR (UARK), Dade, Washington-AR (UARK); **Salem Plateau**: Shannon (Gier, 1955), St. Louis (Schuster, 1992-V); **Boston Mts**: Faulkner-AR (UARK); **Arkansas Valley**: Conway-AR (UARK), Faulkner-AR (UARK), Pulaski-AR (UARK); **Ouahita Mts**: Polk-AR (UARK); **Coastal Plain**: Hempstead-AR (UARK).

## AYTONIACEAE

*Reboulia hemisphaerica* (L.) Raddi **Springfield Plateau**: Barry, Benton-AR (UARK), St. Clair; **Salem Plateau**: Baxter-AR (UARK), Benton, Camden, Carter (DUKE), Dent, Madison-AR (UARK), Marion-AR (UARK), Montgomery (Feigley); Shannon (UMO); **Boston Mts**: Franlin-AR, Faulkner-AR (UARK), Newton-AR (UARK), Washington-AR (Schuster, 1992); **Arkansas Valley**: Conway-AR (UARK), Crawford-AR (UARK), Logan-AR (UARK); **Ouahita Mts**: Garland-AR (UARK), Howard-AR (UARK), Polk-AR (DUKE), Saline-AR.

*Mannia fragrans* (Balbis) Frye et Clark **Springfield Plateau**: Barry, Dade; **Salem Plateau**: Barry (Redfearn); **Boston Mts**: Cherokee-OK.

*Mannia triandra* (Scop.) Grolle **Springfield Plateau**: McDonald; **Salem Plateau**: Camden, Howell, Shannon (KSP), Washington (Darigo).

*Asterella tenella* (L.) P. Beauv. **Springfield Plateau**: Benton-AR (UNAK), Polk; **Salem Plateau**: Baxter-AR (UARK), Camden, Carroll-AR (UARK), Izard-AR (UARK), Perry, St. Louis, Stone-AR (UARK); **Boston Mts**: Cleburne-AR (UARK), Jefferson-AR (UNAR), Newton-AR, Searcy-AR (UNAK), Washington-AR (UNAK); **Arkansas Valley**: Conway-AR (UARK), Crawford-AR (UARK), Faulkner-AR (UARK), Franklin-AR (UNKR), Perry-AR (UNAK), Pope-AR (UNAK), Pulaski-AR (UARK), Scott-AR (UNAK), Sebastian-AR (UNAK), Yell-AR (UARK); **Ouahita Mts**: Grant-AR (UNAR), Pike-AR (UNAR); **Mississippi Lowlands**: Stoddard; **Coastal Plain**: Hempstead-AR (UNAK), Sevier-AR (UNAK).

*Asterella echinella* (Gottsche) Underw. **Springfield Plateau**: Carroll-AR (Schuster, 1992-VI); **Salem Plateau**: Baxter-AR (UARK); **Arkansas Valley**: Pulaski-AR (UARK); **Mississippi Lowlands**: Greene-Ar (Schuster, 1992).

## CONOCEPHALACEAE

*Conocephalum conicum* (L.) Lindb. **Springfield Plateau**: Barry, Benton-AR (UARK), Polk; **Salem Plateau**: Baxter-AR (UARK), Benton, Camden, Carroll-AR (UARK), Carter, Dallas, Dent, Independence-AR (UARK), Jefferson, Laclede, Madison-AR, Marion-AR (UARK), Montgomery (Feigley), Oregon, Ozark, Pulaski, Ozark (F), Ripley, St. Francois (Darigo & Harris), Shannon, Stone-AR (DUKE), Texas Washington (Darigo); **Boston Mts**:

Conway-AR (UARK), Crawford-AR (UARK), Franklin-AR (DUKE), Newton (UARK), Pope-AR, Washington-AR (KSP); **Arkansas Valley**: Franklin-AR (UARK); **Ouahita Mts**: Garland-AR (UARK); Montgomery-AR (UARK).

## MARCHANTIACEAE

*Pressia quadrata* (Scop.) Nees subsp. *quadrata* **Salem Plateau**: Camden, Howell (Darigo), Jefferson (Gier 1955), Stone-AR (Schuster 1992).

*Marchantia polymorpha* L. **Springfield Plateau**: Barry, Greene, Washington-AR (UARK); **Salem Plateau**: Camden, Carter, Dent, Laclede, Ozark, Phelps, Shannon, Stone-AR (DUKE); **St. Francois Mts**: Reynolds; **Boston Mts**: Faulkner-AR (UARK), Newton-AR (UARK).

*Dumortiera hirsuta* (Sw.) Nees var. *hirsuta* **Springfield Plateau**: Benton-AR (UARK); **Salem Plateau**: Carter, Madison-AR, Marion-AR (Schuster 1992) Oregon, Ozark, Shannon, Stone-AR (UARK); **Boston Mts**: Franklin-AR, Faulkner-AR (UARK), Madison-AR; **Ouahita Mts**: Montgomery-AR (DUKE), Pulaski-AR (UARK).

## RICCIACEAE

*Ricciocarpos natans* (L.) Corda **Springfield Plateau**: Greene; **Salem Plateau**: Oregon, Ozark, Ripley, St. Louis (Gier 1955), Stoddard, Texas, **Boston Mts**: Conway-AR (UARK), Faulkner-AR (UARK), Washington-AR (UARK); **Ouahita Mts**: Hempstead-AR (UARK); **Ozark Hills**: Union-IL (SIU); **Mississippi Lowlands**: Greene-AR (UARK).

*Riccia austini* Steph. **Arkansas Valley**: Conway-AR.

*Riccia beyrichiana* Hampe ex Lehm. **Springfield Plateau**: Barry (Gier 1955); **Salem Plateau**: Baxter-AR (UARK);, Carroll-AR (UARK), Izard-AR (McGregor 1960), Marion-AR (UARK); **St. Francois Mts**: St. Francois; **Boston Mts**: Conway-AR (UARK), Crawford-AR (UARK), Washington-AR (UARK); **Arkansas Valley**: Scott-AR (UARK), Sebastian-AR (UARK); **Prairie**: Barton (KSP).

*Riccia bifurca* Hoffm. **Springfield Plateau**: Dade (KSP).

*Riccia canaliculata* Hoffm. **Arkansas Valley**: Conway-AR (UARK).

*Riccia cavernosa* Hoffm. **Salem Plateau**: Shannon; **Arkansas Valley**: Conway-AR.

*Riccia campbelliana* M. A. Howe **Salem Plateau**: Baxter-AR (UARK), Carroll-AR (UARK), Izard-AR (UARK); **Boston Mts**: Conway-AR (Jacobs 1951), Faullkner-AR (UARK), Washington-AR (UARK); **Arkansas Valley**: Logan-AR (UARK); **Prairie**: Barton (KSP)

*Riccia curtisii* (Aust.) T. P. James **Coastal Plain**: Hempstead-AR (UARK).

*Riccia dictyospora* Howe **Salem Plateau**: Baxter-AR (UARK), Independence-AR (UARK); **Arkansas Valley**: Conway-AR (Schuster 1992).

*Riccia fluitans* L. **Springfield Plateau**: Barry, St. Clair; **Salem Plateau**: Camden (UMO), Dent, Howell, Osage, Oregon, Phelps, Ripley, Shannon, Stone, Texas; **Boston Mts**: Conway-AR (UARK); **Ouahita Mts**: Hempstead-AR (UARK): **Ozark Hills**: Union-IL (SIU).

*Riccia frostii* Aust. **Salem Plateau**: Shannon (Gier 1955)); **Arkansas Valley**: Conway-AR (UARK).

*Riccia hirta* (Aust.) Underw. **Springfield Plateau**: Benton-AR (UARK), Newton (KSP), Washington-AR (UARK); **Salem Plateau**: Carroll-AR (UARK), Izard-AR (UARK), Lawrence-AR (UARK); **Boston Mts**: Crawford-AR (UARK), Franklin-AR (UARK), White-AR (UARK); **ARKANSAS VALLELY**: Conway-AR (UARK); **Ouahita Mts**: Hempstead-AR (UARK); **Mississippi Lowlands**: Woodruff-AR (UARK); **Prairie**: Barton.

*Riccia lamellosa* Raddi **Springfield Plateau**: Benton-AR (UARK), Carroll-AR (UARK); **Salem Plateau**: Independence-AR (UARK); **Boston Mts**: Conway-AR (UARK), Crawford-AR (UARK).

*Riccia macallisterii* M. A. Howe **Springfield Plateau**: St. Clair; **Salem Plateau**: St. Louis.

*Riccia membranacea* Gott. & Lindenb. (Missouri and Illinois counties reported in Schuster 1992) **Springfield Plateau**: Benton-AR (UARK), Washington-AR (UARK); **Salem Plateau**: Benton, Butler, Greene-AR (UARK), Lawrence-AR (UARK); Stoddard; **Boston Mts**: Cleburne-AR (UARK), Franklin-AR (UARK), Washington-AR (UARK), White-AR (UARK); **Ouahita Mts**: McCurtain-OK, Pulaski-AR (UARK); **Mississippi Lowlands**: Jackson-AR (UARK), Poinsett-AR (UARK.

*Riccia ozarkiana* McGregor **Springfield Plateau**: Barry; **Salem Plateau**: Izard-AR (Schuster 1992).

*Ricia rhenana* Lorbeer ex K. Müll. **Arkansas Valley**: Conway-AR (UARK); (Gier 1955).

*Riccia sorocarpa* Bisch. **Springfield Plateau**: Barry, Dade (KSP); **Salem Plateau**: Boone; **Boston Mts**: Conway-AR (UARK), Washington-AR (UARK).

*Riccia sullivantii* Aust. **Springfield Plateau**: Cedar; **Salem Plateau**: Shannon; **Ozark Hills**: Union-IL (SIU).

## HORNWORTS

### ANTHOCEROTACEAE

*Anthoceros laevis* subsp. *carolinianus* (L.) Schust. **Salem Plateau**: Boone, Izard-AR (UARK), Sharp-AR (UARK); **Boston Mts**: Faulkner-AR (UARK), Newton-AR (UARK), Washington-AR (UARK); **Arkansas Valley**: Conway-AR (UARK), Franklin-AR (UARK), Johnson-AR (UARK), Logan-AR (UARK), Sebastian-AR (UARK); **Ouahita Mts**: Clark-AR (UARK), Dallas-AR (UARK), Garland-AR (UARK), Grant-AR (UARK), Montgomery-AR (UARK), Pulaski-AR (UARK), Saline-AR (UARK); **Mississippi Lowlands**: Cross, Poinsett-AR (UARK), St. Francis-AR (UARK); **Prairie**: Vernon; **Coastal Plain**: Hempstead-AR (UARK), Sevier-AR (UARK).

*Anthoceros mohrii* Aust. **Ouahita Mts**: Montgomery-AR (Schuster 1992).

*Aspiromitus adscendens* (L. & L.) Schust. (Schuster 1992) **Arkansas Valley**: Scott-AR (UARK).

*Aspiromitus punctatus* subsp. *agrestis* var. *agrestis* (Paton) Schust. (Schuster 1992) **Salem Plateau**: Stone-AR (UARK);St. Francis; **Boston Mts**: Faulkner-AR (UARK), Searcy-AR (UARK), Van Buren-AR, Washington-AR (UARK); **Mississippi Lowlands**: Prairie-AR (UARK).

*Aspiromitus punctatus* subsp. *agrestis* var. *douinii* Schust. (Schuster 1992) **Boston Mts**: Faulkner-AR (UARK); **Ouahita Mts**; Howard-AR (UARK), Polk-AR (UARK); **Coastal Plain**: Nevada-AR (UARK).

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# *Hypogymnia subphysodes* new to North America

Bruce McCune[1] and Roger Rosentreter[2]

A large number of disjunct lichen populations are known on the immediate coast of the Pacific Northwest (McCune et al. 1997). Yet another example was recently found, resulting in the first record for North America of *Hypogymnia subphysodes* (Kremp.) Filson.

*Hypogymnia subphysodes* is a common species in the southern hemisphere, especially Australasia and South America (Elix 1979). It's appearance on the Oregon coast is almost exactly analagous to that of another sorediate Australasian species, *H. pulverata* (McCune et al. 1997). Both species are sorediate, common in their usual continents, and with widely scattered disjunctions. In both cases only one site is known on the Pacific coast. *Hypogymnia pulverata* was, however, found in a *Picea sitchensis* forest (McCune et al. 1997), while *H. subphysodes* was found in the disjunct-rich *Pinus* - ericaceous shrub communities on stabilized sand dunes. It was found on a branch of *Pinus contorta*, associated with *Hypogymnia heterophylla.*

Thin-layer chromatography of the specimen revealed atranorin and physodic acid. The form of the specimen is fairly typical for *H. subphysodes* var. *subphysodes* from Australia (see Elix 1979). The population is probably very small. The specimen in OSC is a single individual. We have not had an opportunity to search the area for more individuals.

**Specimen:** USA: OREGON: Lane County, Clear Lake area, 3.5 km inland from ocean, open *Pinus contorta - Arctostaphylos columbiana* forest mixed with sand dunes, 44°01'N 124°05'W, 50 m, *Rosentreter 10021* (OSC).

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[1] Dept Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331-2902

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# Fellowship Opportunities at UC Berkeley

The University of California, Berkeley, has recently been awarded a PEET grant from the National Science Foundation. This grant is similar in nature to the two bryophyte PEET grants previously funded at the Missouri Botanical Garden and Southern Illinois University; a detailed explanation of the PEET program can be viewed on the World Wide Web at: http://www.nhm.ukans.edu/~peet/

The UC Berkeley PEET grant focuses on the tropical moss family Calymperaceae, and involves studies on three levels: (1) The circumscription and higher-level relationships of the family; (2) Relationships of the genera (and major sections) within the family (the major goal being to verify the monophyly of Mitthyridium and select a few other monophyletic subgroups of the family for monographic study); (3) Species delimitations and relationships within the selected subgroups (e.g., Mitthyridium) culminating in world monographs. At all these levels, but particularly in the latter, we are also considering biological, ecological and geographic factors influencing diversification. This research involves field and herbarium studies to discover and refine taxonomic characters. Laboratory studies including SEM, morphometrics, culture studies, and DNA sequencing are being used to supplement the morphological data.

The project includes training at the undergraduate, graduate, and postdoctoral levels, and funds are available for stipends and research expenses at all these levels. Interested parties are encouraged to contact the PI, Brent Mishler, at <bmishler@socrates.berkeley.edu> for further information on timing and availability of positions.

Of particular urgency are applications for graduate school. A graduate research fellowship for a Ph.D. student working on this research is available beginning in Fall, 1998. The Department of Integrative Biology admits graduate students for study once a year, and applications must be postmarked on or before **December 15, 1997** to be considered for admission for Fall, 1998. The Graduate Record Examination (GRE) should be taken in October 1997 at the latest. The Test of English as a Foreign Language (TOEFL) is an additional requirement for foreign applicants.

To receive graduate application materials, please contact Joan Lubenow, Graduate Admission Coordinator for Integrative Biology (phone (510) 643-5125 or email <jmlubenw@uclink2.berkeley.edu>), immediately.

## Report on Montreal Workshop

In the last few years there has been much discussion about the need to provide sessions of a more practical nature at the ABLS annual meetings. There is still much to be discovered about species distributions, especially in North America, and it is essential that we encourage more amateurs to take an interest in bryophytes and lichens. The great increase in the number of environmental assessments and the importance of these organisms in monitoring environmental changes means that there is a need for accurate identification. The tremendous advance in research techniques over the past few decades often causes the more traditional approaches in bryology and lichenology to be neglected so that there are very few young people developing these "old-fashioned" skills. Many students work in comparative isolation, especially in small institutions, and the annual meeting provides an opportunity for experience to be shared. In August 1997, a first attempt was made to implement these ideas and a workshop took place at the end of the sessions. Unfortunately, Montreal was not the ideal setting since the conference was not held at one of the universities. Thanks to Sylvie Lalonde at UQAM, we were able to use one of their labs which was, luckily, centrally located. They were extremely helpful in providing equipment and a graduate student to act as liason. The timing, too, was not ideal as many members left at the end of the meetings and the post-conference field trip started on the morning of the workshop. In spite of these drawbacks, twenty-one attended, covering the spectrum of membership from young to old, from experienced to inexperienced, from academics to amateurs. It was particularly well received by students and by those teaching undergraduate courses. There were many positive comments such as "We need more of this sort of thing!"

Ideally, it would be better "nested" among the other sessions, possibly one evening - or even two, when more experienced members would be able to mingle with novices. This would pre-suppose a location, such as a university campus or a field station, where facilities would be close together. However, it was a start and those of us who were involved hope that this small beginning will provide a foundation for similar events at future meetings. One other idea arose from this workshop. It was inspired by the sight of a student with a box full of crustose lichens which she needed to identify! A student manual is needed for these species, similar to Mason Hale's "How to Know the Lichens". Ursula Duncan in "An Introduction to British Lichens" provides keys and diagrams for them. Surely, among the members of ABLS there has to be a group which could put together a similar volume for NorthAmerica which would enable identification to be made without the need for expensive equipment? Perhaps ABLS could finance the printing so that the cost could be kept low for the benefit of students and to encourage amateurs to become interested. **Joan Crowe**

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# Books for Beginners in Bryology

Norton G. Miller[1] and William R. Buck[2]

People in increasing numbers want to learn about the bryophytes they encounter in their daily activities or on vacations. For some, the need to learn is sparked only to know why a lawn has become invaded by moss, or why mosses appear anew each year in gardens, or whether the mosses and other bryophytes that grow on tree bark signal trees in decline. Other people seem to be after general information about what bryophytes are and how they differ from other kinds of plants with which they may be more familiar. However, some are not content until they can name what they find on walks and field trips, and a few even want to build a collection of bryophytes and learn most or all of a local bryoflora.

Given all of these interests, how is it possible for someone to acquire basic introductory information about bryophytes? We have assembled the attached bibliography as one answer to this question. There is no one book that will satisfy everyone equally well, especially people in all age groups. To overcome this problem, we have designated in the bibliography whether a given book was written mainly for children, students (high school or college), or adults, in the hope that this may help guide the uninitiated. We have purposely avoided literature written for specialists or dedicated naturalists, because members of both groups may have already accumulated a substantial knowledge of botany. Another difficulty for beginners in North America is the large size of this continent. A book written as an identification guide for one region will not necessarily work in another, because climatic and vegetational differences lead to significant variation in the bryophyte flora. However, general information about the biology of bryophytes, such as structure, life history, and ecology, are uniform from place to place, and a treatise dealing mainly with these topics is usable over a broad area.

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For a beginner, a book that explains and illustrates technical terms in a straightforward way is especially valuable. Bryology, in common with many fields in biology, has its own unique terminology that may be difficult to comprehend at first. When this initial hurtle is passed, however, one can go on to learn identification skills more easily. The goal may be to identify species in the field, which can be done with practice using a handlens, following more detailed study of the plants indoors, and often with the aid of dissecting and compound microscopes. The need for such advanced equipment and the tedium involved in preparing materials for observation, deter many beginners, but these difficulties are surmountable with patience and persistence. In many parts of North America, local groups of professional and amateur bryologists meet regularly and undertake field excursions and workshops. Museums, botanical gardens, and university botany or biology departments are likely to have information on such gatherings, at which much can be learned.

We have included in the bibliography both currently available and out-of-print literature, knowing that items in both categories will be available at public and university or college libraries. Older literature can be problematic because the technical names of bryophytes in it are sometimes out of date. However, this difficulty can be overcome by consulting lists of synonyms that have been published as a part of standard reference lists of North American mosses, peat mosses, and liverworts and hornworts (Anderson, 1990; Anderson *et al.*, 1990; Stotler & Crandall-Stotler, 1977). While much of the older literature may be disappointing as identification guides to names of bryophytes in current use, in fact it often contains a wealth of information that can be read with greater profit when it is brought to a modern nomenclatural standard.

For those who have mastered an understanding of the structure of bryophytes and wish to gain experience in the identification of mosses, liverworts, and other bryophytes, one or more of the books listed in the bibliography is a suitable beginning. Several cautions are necessary. It takes some experience to identify even the commonest species in a given area, although one or more of the books may be helpful in assigning at least a generic name to frequently encountered bryophytes. It may be difficult for beginners to name species using a handlens only, and recourse to dissecting and compound microscopes is often necessary.

Indeed, identification keys may require the user to make dissections of plants (for example, sections of leaves and stems), and to undertake other preparatory work before observations can be made. This process requires practice and perhaps is best accomplished under the tutelage of a more experienced friend or a teacher. Beginners can become adept at naming bryophytes in the field, and many have found this to be an attainable goal. If you live near a university, museum, or botanical garden that maintains a herbarium, you will learn much by obtaining permission to use a bryological collection as a source of materials against which you can compare your collections and identifications. Users of a general field guide need to know that not all species of a region may be treated. Therefore, the collection of plants before you may not be described in the book you are using. There are several comprehensive regional floras for parts of North America that are professional benchmarks, and these should be sought out by the committed identifier.

We have annotated each entry in the bibliography to provide information that will help guide the user to the appropriate literature. All suitable books that have come to our attention whatever their size or strengths have been included. We welcome information about additions to the list.

The following indices will help users of this guide to find books suited to their background and purpose. Entries marked with (ID) are considered especially useful identification guidebooks.

**Elementary school students**: Cochrane, Davis, Greenaway, Jensen.

**Middle school students**: Cochran, Greenaway, Hale, Jensen, Johnson, Sterling.

**High School students**: Armstrong, Hale, Hutchins, Johnson, Miller & Miller, Palmer, Perry, Rockcastle, Russell, Shuttleworth & Zim.

**College/University students**: Armstrong, Arzeni (1963, 1980), Bagnall, Bodenberg (ID), Britton (ID), Conard & Redfearn (ID), Crum (1983 [ID], 1991 [ID]), Hicks (ID), Hutchins, Ireland & Bellolio-Trucco (ID), Jahns (ID), Jameson (ID), Jewell (ID), Malcolm & Malcolm, McQueen (ID), Miller & Miller, Perry, Philips, Richards, Richardson, Rockcastle, Russell, Schofield (1985, 1992 [ID]), Taylor & Underhill, Vitt *et al.* (ID), Watson (1971, 1972, 1981 [ID]).

**Adults**: Armstrong, Bagnall, Bland, Bodenberg, Brightman & Nicholson (ID), Britton, Conard & Redfearn (ID), Crum (1983 [ID], 1991[ID]), Dunham (ID), Gleason, Glime, Grout (1903 [ID], 1947 [ID]), Harthill & O'Connor (ID), Hicks (ID), Hutchins, Ireland & Bellolio-Trucco (ID), Jahns (ID), Jameson (ID), Jewell (ID), Malcolm & Malcolm, Marshall, Maynard, McIntyre, McQueen (ID), Miller &

Miller, Perry, Phillips, Richards, Rockcastle, Russell, Schofield (1985, 1992 [ID]), Taylor, Vitt *et al.* (ID), Watson (1972, 1981[ID]).

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____, H. A. Crum, & W. R. Buck. 1990. List of the mosses of North America north of Mexico. Bryologist 93: 448-499. [Current list of technical names and many synonyms.]

Armstrong, P. K. 1981. Bryophytes: tiny treasures of the plant world. Morton Arboretum Quarterly 17(2): 17-30. Morton Arboretum. Lisle, Illinois. [Excellent short introduction to the broad groups of bryophytes in magazine article format.]

Arzeni, C. B. 1963. Non-vascular plants. 84 pp. Khayats. Beirut, Lebanon. [A college-level laboratory manual for courses in plant morphology and non-vascular plants, emphasizing morphology, using North American species as examples; includes lab exercises.]

____. 1980. Mosses and liverworts. vii + 253 pp. Publ. by Author. Charleston, Illinois. [A general picture key to bryophytes in east-central Illinois; used as an introductory college text in local flora, emphasizing "illustration over description."]

Bagnall, J. E. 1896. Handbook of mosses with an account of their structure, classification, geographical distribution, and habitats (ed. 4). viii + 98 pp. Swan Sonnenschein & Co., Ltd. Paternoster Square, England. [Primarily intended as an introduction to mosses, with little to aid in identification.]

Bland, J. H. 1971. Forests of Lilliput. The realm of mosses and lichens. xiv + 210 pp. Prentice-Hall, Inc. Englewood Cliffs, New Jersey. [Middle and high school, adults; a collection of essays on bryophyte (and lichen) biology, use, and cultural contexts, includes a "key" to species by habitat type; not a field guide; illustrated with drawings and photographs; some errors, and in the words of one reviewer, "a curious mixture of fact (few), lore (interesting), and fantasy (too much)," W. D. Reese (Bryologist 75: 208, 209 (1972)).]

Bodenberg, E. T. 1954. Mosses, a new approach to the identification of common species. xii + 264 pp. Burgess Publishing Co.

Minneapolis, Minnesota. [Adults, especially college students; includes a thorough introduction to morphology, habitats and other ecological topics, and study techniques, but much of the book is a lengthy treatment of the common species of North America, these described and illustrated with original but stylistic line drawings; keys, glossary; spiral binding.]

Brightman, F. H., & B. Nicholson. 1972. The Oxford book of flowerless plants; ferns, fungi, mosses and liverworts, lichens, and seaweeds. viii + 208 pp. Oxford University Press. London. [Reprint of 1966 edition; a guide to the identification of cryptogamic plants with extensive color illustrations; probably not overly helpful for bryophytes because of insufficient detail in the illustrations. Translated into Spanish by X. Llimona Pagés in 1977 as Guia de Campo de las Plantas sin Flores.]

Britton, E. G. 1894-1895. How to study the mosses. 48pp. 8 parts. E. F. Bigelow. Portland, Connecticut. [This series of eight articles, originally published in The Observer (and its separately published section, Practical Microscopy) seem to never have been finished; each begins with a bit of moss poetry (unattributed) and follows with various essays on how to collect, dissect, and study mosses; various taxonomic groups are treated, but only some of the acrocarps; an excellent introduction to the study of mosses.]

Cochrane, J. (ed.) 1972. Plants without flowers. 61 pp. Castle Books. London. [A children's book emphasizing the differences between the major cryptogamic groups.]

Conard, H. S., & P. L. Redfearn, Jr. 1979. How to know the mosses and liverworts (ed. 2). xii + 302 pp. Wm. C. Brown Company. Dubuque, Iowa. [Extensive revision of earlier editions (by Conard, 1944, 1956); written for beginning students and serious amateurs; treats nearly all common North American species; the key (very long) requires practice; associated illustrations helpful; sources of more technical literature listed; glossary, introductory summary explains morphological terms, collecting techniques, and procedures for the successful observation of microscopic characters.]

Crum, H. 1983. Mosses of the Great Lakes forest (ed. 3). 417 pp. University of Michigan Herbarium. Ann Arbor, Michigan. [Written as an identification guide and course text for bryology classes at the University of Michigan Biological Station in Pellston, Michigan; keys, description, illustrations, interesting narratives on many

bryological topics; suitable for use throughout the Great Lakes region of the United States and Canada.]

____. 1991. Liverworts and hornworts of southern Michigan. vii + 233 pp. University of Michigan Herbarium. Ann Arbor, Michigan. [Useful over a large part of the American Middle West; good introductory material, well-presented descriptions and many original illustrations (photographs and line drawings); simple but easily used keys; highly recommended as a beginning point in independent study of the flora of flatlands of the central United States.]

Davis, B. J. 1975. The world of mosses. 64 pp. Lothrop, Lee & Shepard Company. New York. [Juvenile (elementary and middle school); focus on mosses, including biology; simple but effective illustrations; discussion of plants confused with mosses.]

Dunham, E. M. 1951. How to know the mosses (ed. 2). xxvi + 289 pp. The Mosher Press. Boston. [Adult; revision of 1916 version published by Houghton Mifflin Company; identification guide written on the premise that most genera can be recognized in the field without observing special features with a handlens or microscope (but, in fact, this only sometimes works!); helpful introductory information; many good, original, though sometimes minute, line drawings showing habits and some morphological details; information on meaning of generic names and pronunciation guide using accents (long vs. short vowels), both sometimes inaccurate.]

Gleason, H. A. 1950. Mosses and moss collection. 34 pp. Publ. by Author. Hartford, Connecticut. [Explains what bryophytes are, where they grow, and how to collect them, but not an identification guide; written for "friends on the mission fields."]

Glime, J. M. 1993. The elfin world of mosses and liverworts of Michigan's Upper Peninsula and Isle Royale. iv + 148 pp. Isle Royale Natural History Association. Houghton, Michigan. [Summary of life cycle; plant parts named, described, and illustrated; numerous common species of the region described and illustrated (color photographs), with species presented by habitat type (bogs and fens, marshland, cedar swamps, streams and lakes, stream banks, dung, deciduous forests, tree bases and trunks, logs and stumps, tip-up mounds, jack pine and boreal forest, post-fire species, shaded rocks, exposed rocks and soil, lakeshore rocks, paths, and dry or disturbed soil; includes information about this region's ecosystems.]

Greenaway, T. 1992. Mosses and liverworts. 47 pp. Steck-Vaughn Library. Austin, Texas. [Mainly for juvenile readers but suited also to adult beginners; American issue of British edition published in 1991 by the Templar Company, and therefore presenting some examples of British bryophytes that are uncommon or absent from North America; nevertheless a good introduction to structure, life cycles, classification, and ecology; many excellent illustrations in color; highly recommended for an introductory overview.]

Grout, A. J. 1903[-1910]. Mosses with hand-lens and microscope: a non-technical hand-book of the more common mosses of the northeastern United States. 5 parts. 416 pp. Publ. by Author. New York. [Reprinted in 1972; a follow-up to the author's earlier Mosses with a Hand-lens; requires basic microscopy rather than purely a handlens in the field.]

____. 1947. Mosses with a hand-lens (ed. 4). xiv + 344 pp. Publ. by Author. Newfane, Vermont. [Used by many (most suited to adults) following the appearance of Ed. 1 (1900) through the 1950s, and still useful today, although the names of many of the mosses described and illustrated have changed; pioneered the use of high quality black and white photographs for plant habits and cellular details; numerous other illustrations taken from the standard reference books of the 19th and early 20th centuries; includes section on liverworts and hornworts contributed by M. A. Howe; keys to genera and species; treats common species of United States and Canada; the very rare ed. 5 has specimens glued into the book.]

Hale, E. H. 1910. Flowerless plants: ferns, mushrooms, mosses, lichens, and seaweeds. Reprint of 1908 edition. 150 pp. Doubleday, Page & Co. New York. [For juvenile readers; but much more advanced than the children's books of today; perhaps best considered a reference for middle and high school students.]

Harthill, M. P., & I. O'Connor. 1975. Common mosses of the Pacific Coast. 114 pp. Naturegraph Publishers Inc. Healdsburg, California. [Key to common species, these described and illustrated as line drawings; common names.]

Hicks, M. L. 1982. Liverworts of the mountains of North Carolina. 175 pp. Center for Instructional Development. Boone, North Carolina. [A spiral bound, user-friendly manual, allowing even beginners to identify hepatics with relative certainty; good for most of the hepatics of the southeastern mountains of the United States.]

Hutchins, R. E. 1966. Plants without leaves: lichens, fungi, mosses, liverworts, slime-molds, algae, horsetails. 152 pp. Dodd, Mead & Company. New York. [Appropriate for high school students and beginning adults; describes and discusses geographic distribution, means of reproduction and survival, and uses of cryptogamic plants.]

Ireland, R. R., & G. Bellolio-Trucco. 1987. Illustrated guide to some hornworts, liverworts and mosses of eastern Canada. Syllogeus 62. 205 pp. [Treats 235 of the "most conspicuous" bryophytes (151 mosses [incl. sphagnum], 82 hepatics, two hornworts) in the area between Newfoundland and southern Manitoba, but useful also for adjacent parts of the United States; stresses identification through observation with a handlens and dissecting microscope; keys, original illustrations, glossary (many terms illustrated), spiral binding; highly recommended.]

Jahns, H. M. 1983. Collins guide to the ferns, mosses & lichens of Britain, northern and central Europe. 272 pp. Collins. London. [A translation of the author's 1980 German edition; the book has gone through four German editions and is also available in French, Spanish, Dutch, Swedish, Norwegian, Danish, and Finnish; includes a key to genera and selected species of mosses and liverworts; otherwise, consists of plates of color photographs opposite short descriptions; although treating a European flora, many of the species are the same as those in North America.]

Jameson, H. G. 1893. Illustrated guide to British mosses; with keys to the genera and species. 75 pp. Publ. by Author. Eastbourne, England. [Student guide to examining and identifying mosses; includes short generic descriptions, brief keys to species, and line drawings of species, but no species descriptions.]

Jewell, A. L. 1955. The observer's book of mosses and liverworts. 128 pp. + 64 pls. Frederick Warne & Co., Ltd. London & New York. [Reprinted in 1964; a book for "week-end" naturalists; after a very brief introduction to bryophytes, proceeds to emphasize identification, primarily on habit and gross morphology; treats the British flora, but much overlap with the northern United States and southern Canada.]

Jensen, A. E. 1965. The how and why wonder book of mushroom, ferns and mosses. 48 pp. Gosset & Dunlap Publishers. New York. [Juvenile readers; treats flowerless plants and fungi and the botanical features of these in relation to other plant groups; basic information on structure, liverwort and moss life cycles, ecology, uses, and how to collect and study mosses; liverworts treated also but less thoroughly; illustrations generally good (many in color) but habits and habitats contrived and likely not drawn from living examples.]

Johnson, S. A. 1983. Mosses. 48 pp. Lerner Publications Company, Minneapolis, Minnesota [Middle and high school, adults; contents and focus generalized, good introductory material and illustrations; includes liverworts too; adaption of Y. Katagiri's Koke no sekai (1981), including all the original photographs by M. Izawa.]

Malcolm, B., & N. Malcolm. 1989. The forest carpet: New Zealand's little-noticed forest mosses, lichens, liverworts, hornworts, fork-ferns and lycopods. 139 pp. Craig Potton. Nelson, New Zealand. [Deals primarily with the New Zealand flora; liberal use of lavish color photographs, photographs show both representative species as well as morphological features, such as liverwort oil bodies and moss peristomes; many of the photographs taken through a microscope and show structures usually not illustrated with photographs.]

Marshall, N. L. 1910. Mosses and lichens, a popular guide to the identification and study of our commoner mosses and lichens, their uses, and methods of preserving. xviii + 327 pp. + 16 plates in color and 32 in black and white. The Nature Library. Vol. 10. Also, New Nature Library Vol. 3, part 2, 1914. Doubleday, Page & Company, New York. [Reprint of 1907 edition; a lengthy, well-illustrated treatise, but information often superseded by better contemporary knowledge; mosses usually treated using broad generic concepts (e.g., *Hypnum* with subgenera, these now mostly elevated to separate genera), liverworts less fully presented than the mosses; early use of color and black and white photographs of mosses; some interesting and useful narratives, but overall primarily of historical value.]

Maynard, C. J. 1905. Methods in moss study in twelve lessons. iv + 128 pp. Publ. by Author. West Newton, Massachusetts. [Lessons focus on the morphological diversity of mosses, and their identification; features observable with microscope and handlens stressed ("mosses can be quite satisfactorily identified with a

handlens, but they cannot be thoroughly studied without a compound microscope"); original drawings in 12 plates; common names.]

McIntyre, K. 1991. A guide to mosses and moss gardening. 12 pp. Privately published. Stockbridge, Georgia. [The booklet was published by a small company (since gone out of business) specializing in moss gardening; a helpful guide to deciding which mosses might best be used in gardening and how to establish them.]

McQueen, C. B. 1990. Field guide to the peat mosses of boreal North America. xvi + 138 pp. + 30 pls. University Press of New England. Hanover & London. [Good background information (principally morphology and ecology), descriptive and random access keys stressing field characters, color photographs of 30 species, descriptions, glossary, further readings; recommended for beginners.]

Miller, H., & N. Miller. 1979. Mark ye the bryophytes. Horticulture 57(1): 40-47. [Magazine article with illustrations in color; written as an introduction to bryology for gardeners and otherwise interested readers.]

Muma, R. 1985. A graphic guide to Ontario mosses. Revised ed. 27 pp. Publ. by Author. Toronto, Canada. [The first edition, also of 1985, was published by the Toronto Field Naturalists; intended only as an aid (relatively crude line-drawings) to probable genus, based on recognizable growth forms.]

Palmer, E. L. 1928. Liverworts, mosses, ferns and their kin. Cornell Rural School Leaflet 22(2). 48 pp. Cornell University. Ithaca, New York. [A general introduction to higher cryptogams, primarily with information on life history; includes a short section for use in identification by means of a table emphasizing habitat, vegetative parts, and reproductive parts.]

Perry, A. R. 1992. Mosses and liverworts of woodland, a guide to some of the commonest species. British Plant Life 1. 40 pp. National Museum of Wales. Cardiff. [Brief description of distinctions between mosses and liverworts, and other general information; 39 spp. described and illustrated by black and white or color photographs, many of the species also occur in the United States and Canada; only plants of acidic forest habitats included.]

Phillips, R. 1980. Grasses, ferns, mosses & lichens of Great Britain and Ireland. 191 pp. Ward Lock Limited. London. [One of the first books of all color photographs that includes bryophytes; published in German as Das Kosmosbuch der Gräser, Farne, Moose, Flechten (1981); the flora treated is European, but with much overlap of northern North America.]

Plues, M. 1865. Rambles in search of flowerless plants (ed. 2). viii + 316 pp. + 20 pls. Journal of Horticulture & Cottage Gardener Office. London. [Popular writing on bryophytes, illustrated with woodcuts and lithographic plates (in part hand-colored).]

Richards, P. 1950. A book of mosses. 40 pp. + 16 color plates. Penguin Books. London. [An elegant small book, with reproductions of illustrations from J. Hedwig's Descriptio et Adumbratio Microscopico-Analytica Muscorum Frondosorum (1787-97) and an informative narrative presenting details about the life history and structure of mosses; a short biographical sketch of Hedwig; 16 common British mosses (many also occurring in North America) described and illustrated.]

Richardson, D. H. S. 1981. The biology of mosses. xii + 220 pp. John Wiley & Sons., Inc. New York. [A college textbook emphasizing ecology, physiology, reproduction, and economic uses of mosses.]

Roberts, M. 1850. Voices from the woodlands, descriptive of forest trees, ferns, mosses, and lichens. viii + 368 pp. Reeve and Benham. London, England. [Appreciation of the beauty of mosses and their useful functions to man and in nature; poetically written.]

Rockcastle, V. N. 1965. Liverworts and mosses. Cornell Science Leaflet 57(4). 32 pp. Cornell University. Ithaca, New York. [Deals primarily with the place of bryophytes in ecosystems; brief life-cycle information.]

Russell, T. H. 1908. Mosses and liverworts: an introduction to their study, with hints as to their collection and preservation. xiii + 200 pp. + 10 pls. Sampson Low, Marston & Company, Ltd. London, England. [An excellent introduction in nontechnical language on bryophyte morphology and life history; new and revised edition published in 1910, with xvi + 211 pp.]

Schenk, G. 1997. Moss gardening, including lichens, liverworts, and other miniatures. Timber Press. Portland, Oregon. 261 pp. [The best introduction to the horticultural uses of bryophytes; emphasis on garden design.]

Schofield, W. B. 1985. Introduction to bryology. xvi + 431 pp. Macmillan Publishing Company. New York. [College/university text; a thorough and wide-ranging summary; excellent illustrations.]

____. 1992. Some common mosses of British Columbia. Royal British Columbia Museum Handbook 28. vi + 394 pp. [An expanded and thoroughly reworked version of the author's previous handbook of British Columbia mosses (1968); introductory material includes life history and structure, collection techniques, ecology, summaries of distributions and habitats, and many other topics; identification key, descriptions and original stippled line drawings of 124 species (about 20% of the species known from the Province); the complete flora given as a list of species (those included vouchered by authenticated specimens only), distribution maps; semi-technical, but suited to beginners; a distinguished local flora.]

Shuttleworth, F. S., & H. S. Zim. 1967. Non-flowering plants. 160 pp. Golden Press. New York. [High school to adult; one of the "A Golden Nature Guide" series; chapter on mosses and on liverworts and hornworts provides an introduction to morphology and life cycles; common names, descriptions, and illustrations (small but accurate water colors) of frequently encountered species; text reviewed by W. A. Weber and W. C. Steere.]

Slack, N. G., & A. W. Bell. 1993. 85 acres, a field guide to the Adirondack alpine summits. 44 pp. Adirondack Mountain Club. Lake George, New York. [General ecological overview of an ecosystem in which bryophytes are prominent; mosses discussed briefly and several are illustrated in color; pocket-guide format.]

____ & ____. 1995. Field guide to the New England alpine summits. 96 pp. Appalachian Mountain Club Books. Boston, Massachusetts. [Some mosses and liverworts described and illustrated in color, as part of a readable and broad account of alpine ecology and natural history.]

Steere, W. C. 1944. The collecting of mosses and liverworts. Instructions to Naturalists in the Armed Forces for Botanical Field Work No. 3. 13 pp. University of Michigan. Ann Arbor, Michigan. [Printed during World War II to instruct enlisted men and women on how to collect bryophytes; provides useful information on how to prepare specimens.]

Sterling, D. 1955. The story of mosses, ferns and mushrooms. 159 pp. Doubleday & Company, Inc. Garden City, New York. [Juvenile readers; chapter on mosses includes some information on liverworts (*Conocephalum* type only); several examples of mosses described and illustrated (haircap, pin cushion, peat mosses); moss life cycle explained; some information on bryophyte biology.]

Stotler, R., & B. Crandall-Stotler. 1977. A checklist of the liverworts and hornworts of North America. Bryologist 80: 405-428. [Current list of technical names and many synonyms.]

Taylor, J., & A. P. Underhill. 1972. Liverworts: a photographic study. vi + 19 pls. with opposing text. Publ. by Authors. Auckland, New Zealand. [Geared toward New Zealand; contains very good black and white photographs of hepatics, primarily showing growth form and leaf insertion; best for thalloid forms.]

Taylor, P. G. 1960. British ferns and mosses. Kew Series 5. 231 pp. Eyre and Spottiswoode. London. [Illustrated by line drawings and watercolor paintings; language nontechnical, about 50 species treated, almost all of which also occur in North America; no keys.]

Thomas, L. P., & J. R. Jackson. 1985. Walk softly upon the earth, a pictorial field guide to Missouri mosses, liverworts and lichens. viii + 129 pp. Missouri Department of Conservation. Jefferson City. [Common species only; color photographs and drawings; introductory narrative; some errors.]

Vitt, D. H., J. E. Marsh, & R. B. Bovey. 1988. Mosses, lichens, & ferns of northwest North America. 296 pp. Lone Pine Publishing. Edmonton, Alberta. [Much good introductory material, including summaries about habitats and vegetation of the Northwest (Saskatchewan, west to the Pacific Coast, Alaska, and Oregon), general descriptions of a broad selection of mosses and liverworts (peat mosses too), keys to common species (which are illustrated with color photographs), descriptions and distribution maps for each.]

Watson, E. V. 1971. The structure and life of bryophytes (ed. 3). 221 pp. Hutchinson University Library. London. [Broad readable introductory survey; written for "advanced," i.e., college/university, students.]

____. 1972. Mosses. Oxford Biology Readers 29. 16 pp. Oxford University Press. London, England. [A booklet for high school and beginning college students; provides a background on reproduction, morphology, ecology, and systematics.]

____. 1981. British mosses and liverworts: an introductory work, with full descriptions and figures of over 200 species, and keys for the identification of all except the very rare species (ed. 3). xviii + 519 pp. Cambridge University Press. Cambridge, England. [First edition published in 1955, the second in 1968; microscope needed, but the language of the keys not highly technical; descriptions written in sentence form; many of the most common North American mosses included.]

Watson, H. 1947. Woodland mosses. Forestry Commission Booklet 1. 45 pp. H. M. S. O. London, England. [Twenty spp. treated, most in North America, each with two black and white photographs, one of a single stem and the other a field habit; descriptions given at hand-lens level with ecological notes.]

# The genera *Anomobryum* and *Leptobryum* (Musci: Bryaceae) in Maine

Bruce Allen[1]

*Anomobryum,* a genus of 47 species, is found throughout the world. The genus is based on a single morphological feature: plants with julaceous to imbricate leaves. The most common species in the genus, *A. julaceum* (Gaertn., Meyer & Schreb.) Schimp., also has strikingly thick-walled, linear-vermicular upper leaf cells and broadly obtuse leaves, however, other species of *Anomobryum* are more pedestrian with firm-walled, rhomboidal-hexagonal upper leaf cells and broadly acute leaves. Sporophytically the genus is wildly variable. Some species have fully formed, perfect peristomes and others have the exostome or endostome variously reduced or rudimentary (see Shaw & Fife 1984). The genus is generally recognized by European taxonomists (Koponen et al. 1977, Smith 1978, Corley et al. 1981, Preston 1984, Casas 1991, Cortini Pedrotti 1992, Nyholm 1993). Crum and Anderson (1981), however, placed it within the genus *Pohlia,* while Ochi (1972, 1980, 1992, 1994) has consistently treated it as a subgroup of *Bryum.* Although Shaw (1982) and Shaw and Fife (1984) recognized *Anomobryum* at the generic level, their views considered the genus only from the perspective of its relationship with *Pohlia* and not its relationship to *Bryum.* In a restricted sense there are a number of species centered around *A. julaceum* that seem to be generically distinct from *Bryum.* However, when the genus is expanded beyond this very narrow concept it merges imperceivable into *Bryum. Anomobryum julaceum* is the only species of genus in Maine.

*Anomobryum* Schimp., Syn. Musc. Eur. 382. 1860.

Plants small, slender, in erect, gregarious or loose tufts, simple or sparsely branched. Leaves closely imbricate when wet or dry, ovate or oblong, weakly decurrent, obtuse to rounded at the apex or broadly acute, concave; margins plane to erect, entire to serrulate or obscurely crenulate near apex; cells smooth, thin- or thick-walled, upper cells

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linear-vermicular, rhomboidal or rhomboidal-hexagonal, basal cells distinctly differentiated from upper cells, broader, rectangular, thinner-walled. Setae elongate, straight. Capsules pendent, horizontal to suberect. Annulus well-developed. Peristome diplolepideous, endostome and exostome perfect, variously reduced or rudimentary.

*Anomobryum julaceum* (Gaertn., Meyer & Schreb.) Schimp., Syn. Musc. Eur. 383. 1860.
*Bryum julaceum* Schrader *in* Gaertn., Meyer & Schreb., Oek. Techn. Fl. Wetterau 3(2): 97. 1802.

*Anomobryum filiforme* (Dicks.) Husnot, Muscol. Gall. 222. 1888., not *Anomobryum filiforme* (Griff.) Jaeg., Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1873-74: 142. 1875. *Pohlia filiformis* (Dicks.) Andrews in Grout, Moss Fl. N. Amer. 2(3): 205. 1935. *Bryum filiforme* Dicks., Pl. Crypt. Brit., fasc. 4: 16. 1801.

Plants small, yellow-green, glossy, gregarious or in loose tufts. Stems slender, julaceous, simple or with subperichaetial branches, to 25 mm high; rhizoids sparse at base. Leaves 1--1.5 mm long, imbricate, firm, not contorted dry, concave, oblong to oblong-ovate, obtuse to broadly rounded-apiculate; margins plane, not bordered, entire to weakly serrulate above; costa subpercurrent; upper cells linear-vermicular, thick-walled, 40--100 x 4--6µm, basal cells rectangular to quadrate, abruptly broader, thin-walled, 50--80 x 14--16µm. Dioicous. Perichaetial leaves longer than vegetative leaves, narrowly acuminate. Setae to 25 mm long, red. Capsules 1.5--3 mm long, red-brown, oblong-pyriform, constricted to a short, slender neck, pendent, horizontal or suberect; annulus compound and revoluble; opercula 0.5 mm long, conic-apiculate; exostome teeth yellow-brown, densely papillose, endostome hyaline, lightly papillose, basal membrane to ½ of exostome teeth length, segments well-developed, broadly perforate, cilia 2--3, appendiculate. Spores 10 µm, smooth.

On soil or in rock crevices often at base of cliffs or rock outcrops. In Maine known from Oxford (*Adams* MAINE) County.

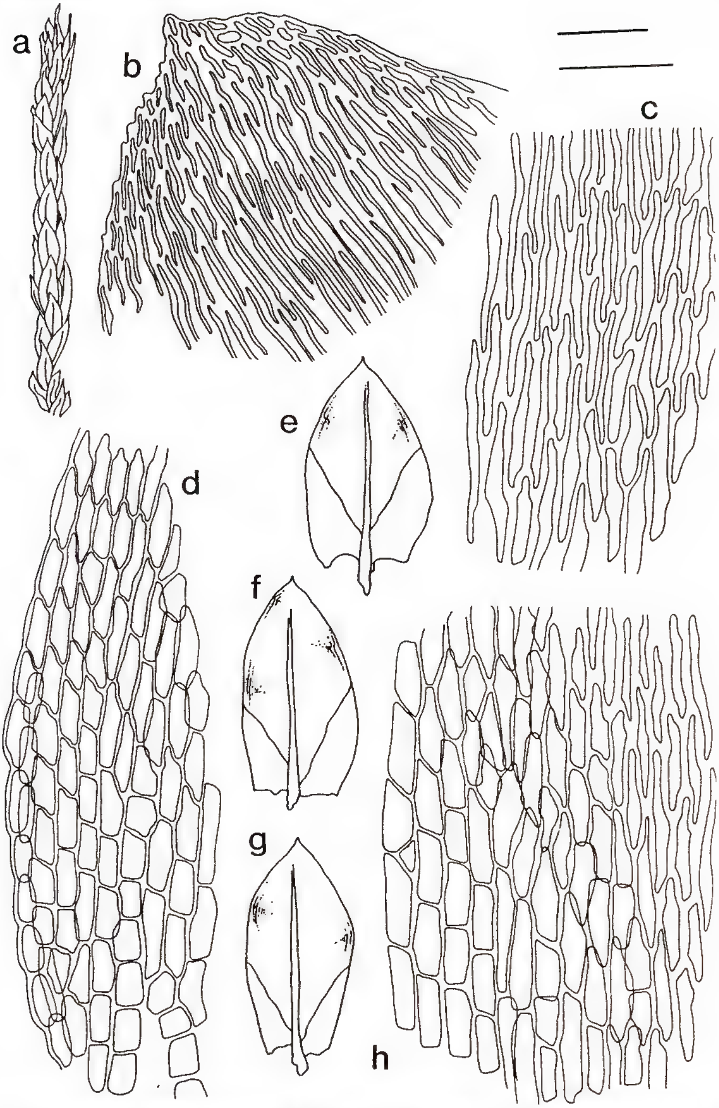

Figure 1. *Anomobryum julaceum*. a. Habit. b. Leaf apex. c. Median leaf cells. d. Basal leaf cells in alar region. e. f. & g. Leaves. h. Leaf cells in transition region between upper and lower cells. Scales in mm: upper bar = 0.05 (b,c,d,h); upper bar = 2.12 (a); lower bar = 0.5 (e,f,g) All figures drawn from *Sharp 2321* (MO).

*Anomobryum julaceum* is a cosmopolitan species that is extremely variable throughout its range. The species commonly has a smoothly julaceous aspect, and broad, bluntly obtuse leaves with narrow, linear-vermicular, thick-walled upper leaf cells that strongly contrast with its broadly rectangular, thin-walled, often bulging, lower leaf cells. It can be confused with *Bryum argenteum* Hedw. or *Myurella julacea* (Schwaegr.) B.S.G. both of which also have a smoothly julaceous appearance. However, *B. argenteum* has a glaucous-green to whitish color while *A. julaceum* is yellowish-green. *Myurella julacea* is a pleurocarpous moss with ecostate leaves and papillose leaf cells. *Anomobryum julaceum* is acrocarpous, has leaves with a strong single costa and smooth leaf cells.

Our species has commonly been called *A. filiforme* in North America and indeed the species epithet *filiforme* predates *julaceum* by a year. But, *filiforme* cannot be used in *Anomobryum* for our species because that name is already in use for a different species of *Anomobryum* from India.

*Leptobryum* (B.S.G.) Wils., Bryol. Brit. 219. 1855.
*Bryum* subg. *Leptobryum* B.S.G., Bryol. Eur. 4: 1. 1851.

Plants small, slender, pale green, in erect, dense or loose, laxly foliate tufts, simple. Tubers often present on rhizoids. Lower leaves erect-spreading from insertion, lanceolate; upper leaves abruptly larger, and strongly clasping, flexuose when dry, long-subulate to setaceous from a broad, oblong base, leaves not decurrent, acuminate; margins plane, entire below, serrulate above; cells smooth, long-rectangular below, long-linear above; costa strong 1/3-2/3 of the lower leaf, filling most of the subula, subpercurrent to excurrent. Setae terminal, elongate, flexuose. Capsules pyriform, pendent, neck long and narrow; opercula conic, mammillate; annulus revoluble; stomata superficial; peristome double, teeth 16, lanceolate, papillose, yellow to brown; endostome hyaline, lightly papillose, basal membrane well-developed, segments keeled and perforate, cilia 3, appendiculate, rudimentary or absent. Calyptrae cucullate, naked. Spores spherical, lightly papillose.

*Leptobryum* is a genus of six species, five of which are narrowly distributed in western and southern South America or Australia. The exception, *L. pyriforme* (Hedw.) Wilson, is cosmopolitan. *Leptobryum* is gametophytically variable, e.g., *L. wilsonii* (Mitt.) Broth has gametophytes very similar to some *Pohlia* species (Crum 1994), while *L. pyriforme* has slenderly lanceolate to setaceous leaves that strongly clasp at base. Sporophytically the perfect diplolepideous peristome of *Leptobryum* is identical to those found in many members of the Bryaceae, but its shiny, pyriform capsules with long slender necks define the genus.

*Leptobryum pyriforme* (Hedw.) Wils., Bryol. Brit., 219. 1855.
*Webera pyriformis* Hedw., Sp. Musc. Frond. 169. 1801.

Plants small and slender, pale to yellowish-green to 10 mm high; rhizoids moderately developed at base, sometimes with globose brood bodies; axillary hairs 3--4 cells, lower 2 cells rectangular and maroon-red, upper 1--2 cells oblong, hyaline and deciduous. Lower leaves 1.5 mm long, upper leaves 4--5 mm long; upper cells 40--50 x 4 µm, lower cells 70--90 x 6 µm, alar cells not differentiated. Leaf axils occasionally with reddish, globose gemmae. Synoicous. Setae 20--30 mm long, flexuose or straight, yellow-brown. Capsules 3 mm long, pyriform, pendent, neck long and narrow, to 1.5 mm long; opercula 0.5 mm long, conic-mammillate; exostome teeth yellow, densely papillose, endostome yellowish-hyaline, lightly papillose, basal membrane to 1/2 of exostome teeth length, segments well-developed, broadly perforate, cilia 3, appendiculate. Spores 10--16 µm, lightly roughened.

On soil at base of cliffs and in disturbed habitats. In Maine known from Androscoggin (*Allen 14698* MO), Cumberland (*Lowe* MAINE), Franklin (*Lowe* MAINE), Hancock (*White* NY), Kennebec (*Carlson* MAINE), Knox (*Crockett* MAINE), Oxford (*Lowe* MAINE), and Piscataquis (*Hodgkins* MAINE) Counties.

*Leptobryum pyriforme* is a small, slender species often found in weedy habitats. In the northern hemisphere it is a common greenhouse weed. The leaves are dimorphic with the lower ones slenderly lanceolate and the upper ones setaceous and strongly clasping at base. Its alar cells are undifferentiated, the leaves not decurrent, the costa broad at base and nearly filling the upper limb, and the leaf cells long, narrowly

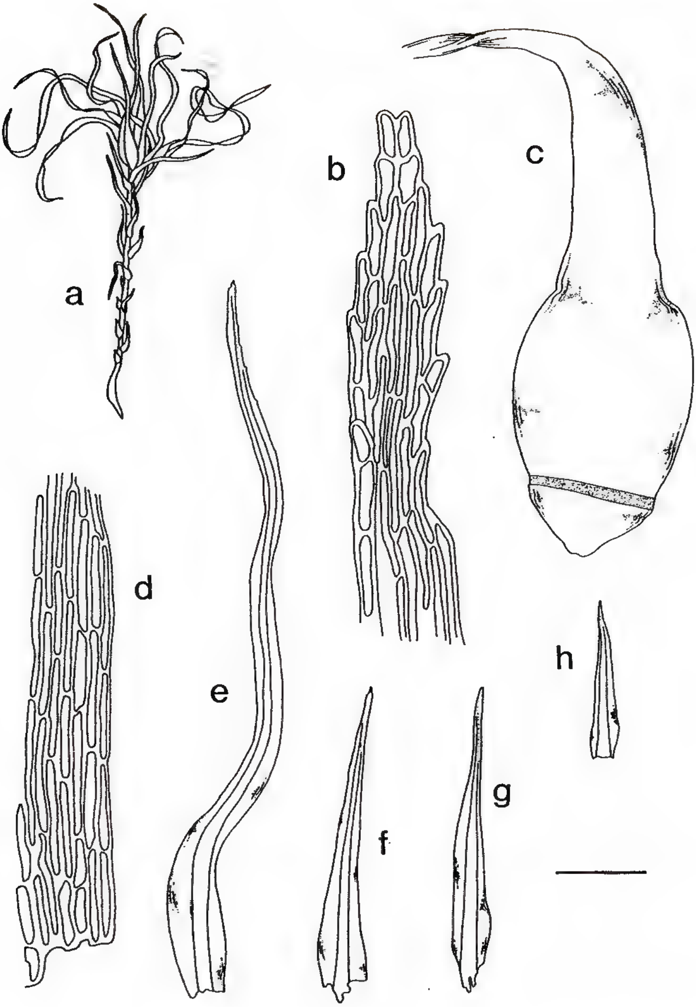

Figure 2. *Leptobryum pyriforme*. a. Habit. b. Leaf apex. c. Capsule. d. Basal marginal leaf cells. e. Leaf from upper part of stem. f. & g. Leaves from middle of stem. h. Leaf from bottom of stem. Scales in mm: bar = 0.05 (b,d); bar = 0.5 (c,e,f,g,h); bar = 2.65 (a). All figures drawn from *Allen 14698* (MO).

rectangular throughout. Superficially it can be confused with a number of *Dicranella* species that have clasping leaves. But, those species differ from *Leptobryum pyriforme* in having short-rectangular leaf cells. Since *L. pyriforme* is synoicous it is commonly found with sporophytes. Its long, often flexuose setae and pendent, glossy, pyriform capsules which are abruptly narrowed to a long neck are good, distinctive field characters. The unusual axillary hairs of *L. pyriforme* were previously noted by Crum & Anderson (1981). They consist of 3--4 cells of which the lower 2 are rectangular, dark red, and persistent while the upper 1-2 are oblong, hyaline, and deciduous.

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# A Simple Method to Extract DNA from Bryophytes for RAPD Analysis

Stephen L. Timme[1] and Alan Ross[1]

Traditionally, morphological characters have been used for the identification of bryophytes. Although this method is still employed by most bryologists, recent developments in polymerase chain reaction (PCR) for methods such as Randomly Amplified Polymorphic DNA analysis (RAPD) have opened up new methods for distinguishing closely related taxa. RAPD analysis serves as an additional method among several methods in taxonomic diagnosis, especially for taxonomically questionable taxa. Hadrys, et al (1992) have provided an overview of the potential of RAPD analysis for establishing systematic relationships at various taxonomic levels. Drawbacks to the RAPD technique has typically been the large amount of plant tissue needed for extraction of DNA. Also, the reliance of most DNA extraction procedures on hazardous organic chemicals such as phenol and chloroform are dangerous to use and can sometimes contaminate samples.

During the course of conducting DNA comparison studies on several species of *Frullania* and *Leucobryum*, the authors modified a method of DNA extraction first described by K. Edwards, et al. (1991). The following extraction procedure requires little material and is not subject to hazardous organic chemicals.

Obtain approximately 250 µg of tissue from the sample. This amount may vary depending upon the amount of material available. The tissue is then placed into a 1.5 ml Eppendorf microtube and enough liquid nitrogen is added to cover the sample. Once the liquid nitrogen has evaporated, a disposable grinder is used to macerate the tissue for approximately 15 seconds. Add 400 µl of extraction buffer (200 mM Tris HCL with a pH of 7.5, 250 mM NaCl, 25 MMEDTA, 0.5% SDS) to each tube and vortex for 5 seconds. All samples are then centrifuged at 10,000 rpm for 5-10 minutes. After centrifugation, the

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supernatant is carefully poured out of the tube, and the tube is dried overnight, upside down, with the lid open in a freezer. After all the supernatant has evaporated, 100 µl RNAse (10mg\ml) is added to each tube.

Once this procedure is completed, the extracted DNA can be qualitated by running 10 µl of sample mixed with 2 µl of 6X Buffer (0.25% bromophenol blue, 40% [w/v] sucrose in water) on a 1.0% agarose gel and visualizing by ethidium bromide staining (Maniatis, T., et al. 1982). DNA can also be quantitated using a spectrophotometer at 260 nm or using DNA dipsticks (Invitrogen Corp.).

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# The genera *Rhabdoweisia* and *Dichodontium* (Musci: Dicranaceae) in Maine

Bruce Allen [1]

*Rhabdoweisia*, with nine species worldwide, is a genus of small mosses with crisped to contorted leaves, short erect capsules that are prominently 8-ribbed when dry, and slender, fragile peristome teeth that are united at base into a short basal membrane. Due to its peristome form it fits uncomfortably in the Dicranaceae, and so is relegated to its own subfamily the Rhabdoweisioideae. *Rhabdoweisia* is similar to *Amphidium* in its leaf areolation, cell ornamentation, costal cross-section, cucullate calyptrae, ovoid, strongly ribbed capsules, and the absence of a stem central strand. The two genera have been treated together in the Rhabdoweisiaceae (Anderson & Crum 1959). Although the peristome of *Rhabdoweisia* is reduced, it appears to be haplolepideous. *Amphidium* lacks a peristome, however, Lewinsky (1976) placed *Amphidium* near the Orthotrichaceae because of the developmental similarity of its young sporophytes to those of *Orthotrichum*. She did not however examine the developmental stages of young *Rhabdoweisia* sporophytes and it would be interesting to see if they too resembled that of *Orthotrichum*. Recently, Goffinet (1997), using chloroplast DNA analysis, excluded *Amphidium* from a relationship with the Orthotrichales.

The name *Rhabdoweisia* combines the Greek "*rhabdotos* - striped" and "*weisia* - a moss genus in the Pottiaceae" in reference to its distinctly ribbed capsules and a resemblance to the genus *Weissia*. The genus was revised by Lawton (1961).

*Rhabdoweisia* Bruch & Schimp *in* B.S.G., Bryol. Eur. 1: 97. 1846.

Plants small, in dense tufts or cushions, dark-green above, brown below; stem central strand absent. Leaves spreading when moist, crisped when dry, narrowly lanceolate, oblong-lanceolate to linear-lanceolate, keeled, acute, obtuse, or acuminate, entire or serrulate above; costa

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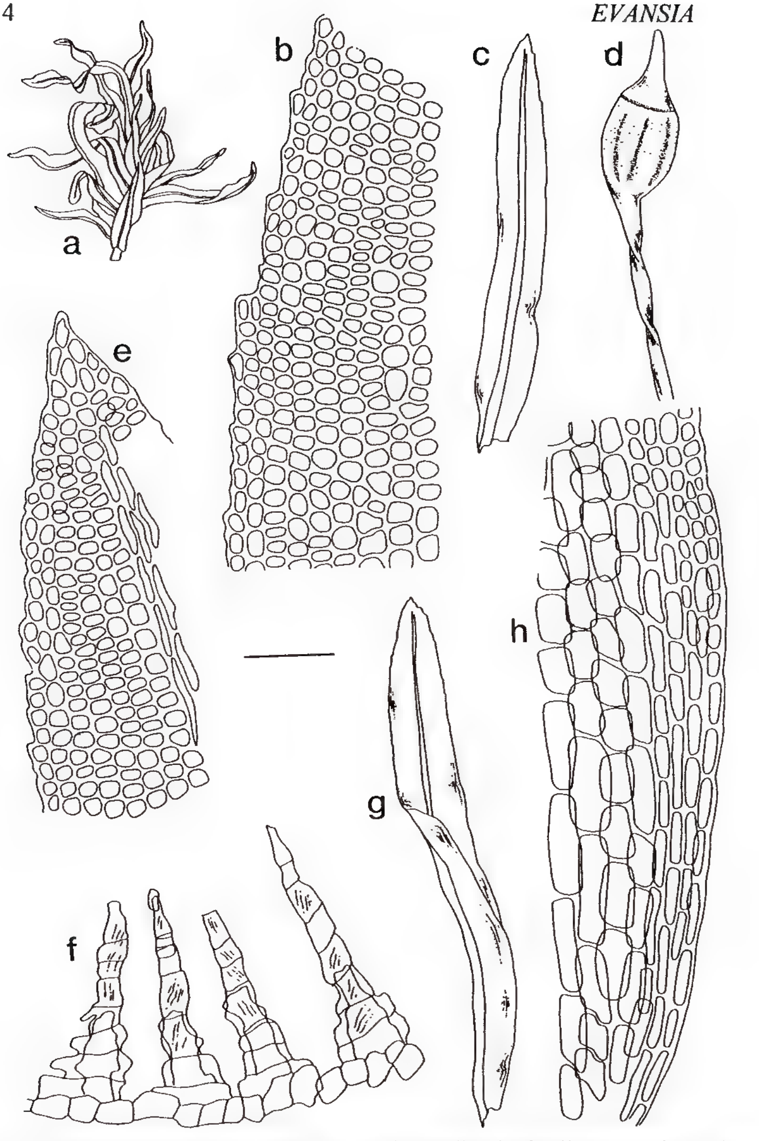

Figure 1. *Rhabdoweisia crispata*. a. Habit. b. Median leaf cells at margin. c. & g. Leaves. d. Upper seta, capsule, and operculum. e. Leaf apex and apical leaf cells. f. Peristome teeth. h. Basal leaf cells at margin. Scales in mm: bar = 0.05 (b,e,f,h); bar = 0.5 (c,d,g); bar = 1.13 (a). All figures drawn from *Allen 3688* (MO).

ending below the apex, in cross-section with dorsal stereids well-developed, ventral stereids absent or weakly developed; margins plane or recurved, upper leaf cells quadrate to transversely elongate, smooth, or at times bulging mammillose, basal cells rectangular-elongate, hyaline, alar cells not differentiated. Autoicous, perigonia axillary below the perichaetia. Setae elongate, erect; capsules exserted, oval to short-cylindric, erect and symmetric, 8-ribbed when dry; stomata present in neck; peristome of 16 filiform, undivided teeth, sometimes fugaceous, smooth or obliquely striate, from a low basal membrane; operculum obliquely rostrate. Spores finely papillose. Calyptra cucullate.

*Rhabdoweisia crispata* (With.) Lindb., Acta Soc. Sci. Fenn. 10: 22. 1872 [1875].
*Bryum crispatum* With., Syst. Arr. Brit. Pl. (ed. 4) 3: 816. 1801.

Plants small, densely tufted; stems 5--10 mm high. Leaves 2--3.5 mm long, crisped when dry, oblong-lanceolate to lanceolate, sharply acute; margins plane or recurved below, serrulate to nearly entire above; costa ending below the apex; upper cells 10--14 μm, subquadrate to transversely elongate, thin-walled. Setae 2--4 mm long; capsules 0.5--0.8 mm long, ribbed when dry, peristome teeth linear-lanceolate, often perforate or irregular, smooth or faintly striolate. Spores 10--20 μm.

On soil in cracks of vertical rock outcrops and cliffs in shady, forest situations. In Maine known from Franklin (*Allen 15874* MO); Oxford (*Allen 16680* MO); Sagadahoc (*Allen 3688* MO), and Somerset (*Allen 9408* MO) counties. Reported from Hancock (Patterson 1930) and Waldo (Parlin 1939) counties.

*Rhabdoweisia crispata* is commonly found in small patches in crevices of moist, shaded rock faces. It is dark-green in color and due to its small size and strongly crisped leaves can be mistaken for *Amphidium*, which also occupies similar habitats, or something in the Pottiaceae. Fortuantely, it is autoicous and is usually found with capsules. The presence of 16 fragile peristome teeth separate it from the eperistomate *Amphidium*, while its short, erect capsules that are strongly 8-ribbed when dry as well as its smooth leaf cells separate it from the Pottiaceae.

The species is remarkably widespread. In North America it is found from Newfoundland and Labrador south to Georgia west to Manitoba, the Great Lakes region, Tennessee and Kentucky, and in Alaska. It is also found in Greenland, throughout Europe, Bolivia, Juan Fernandez Islands, Hawaii, Japan, eastern Asia, and Java.

*Dichodontium* Schimp. Coroll. Bryol. Eur. 12. 1856.

Plants small to medium sized, dull, yellow-green or dark-green. Stems triangular or round, sparsely radiculose below. Leaves broad, oblong-lanceolate or lingulate, bluntly acute to rounded-obtuse, regularly or irregularly dentate above; costa subpercurrent, in cross-section with both dorsal and ventral stereids or dorsal stereids only; cells mammillose or conic-papillose above and along the basal margins, interior basal cells smooth, upper cells quadrate, subquadrate, or oblate, basal cells rectangular, alar cells not differentiated. Dioicous. Setae erect, elongate; capsules long exserted, suberect to curved; annulus simple; stomata present; peristome teeth divided, vertically striolate below, papillose above. Calyptra cucullate, roughened at apex.

*Dichodontium* is a combination of the Greek "dicho - in two" and "odontos - tooth", a reference to the divided peristome teeth found in the genus. A genus of 8 species, only two of which (*D. pellucidum* (Hedw.) Schimp. and *D. olympicum* Ren. & Card.) are reasonably well-known.

*Dichodontium pellucidum* (Hedw.) Schimp., Coroll. Bryol. Eur. 12. 1855
*Dicranum pellucidum* Hedw. Sp. Musc. Frond. 142. 1801.

Plants small to medium sized in loose or compact tufts, dull, yellow-green or dark-green. Stems 3--18 mm high, rounded or triangular in cross-section, sparsely radiculose below, rhizoids red, smooth. Leaves 1--2 mm long, erect-incurved to erect-contorted dry, spreading to erect-spreading wet, oblong-ovate, oblong-lanceolate or lingulate, broadly acute to rounded-obtuse, decurrent; margins regularly or irregularly dentate, plane above, often narrowly recurved below; costa subpercurrent, mammillose at back, in cross-section with 1 or 2 stereid bands; upper cells quadrate, subquadrate to oblate, 7--12 µm x 10 µm, stoutly mammillose, lower cells at margins quadrate to subrectangular, mammillose, interior lower cells long-rectangular, smooth, 32--50 µm

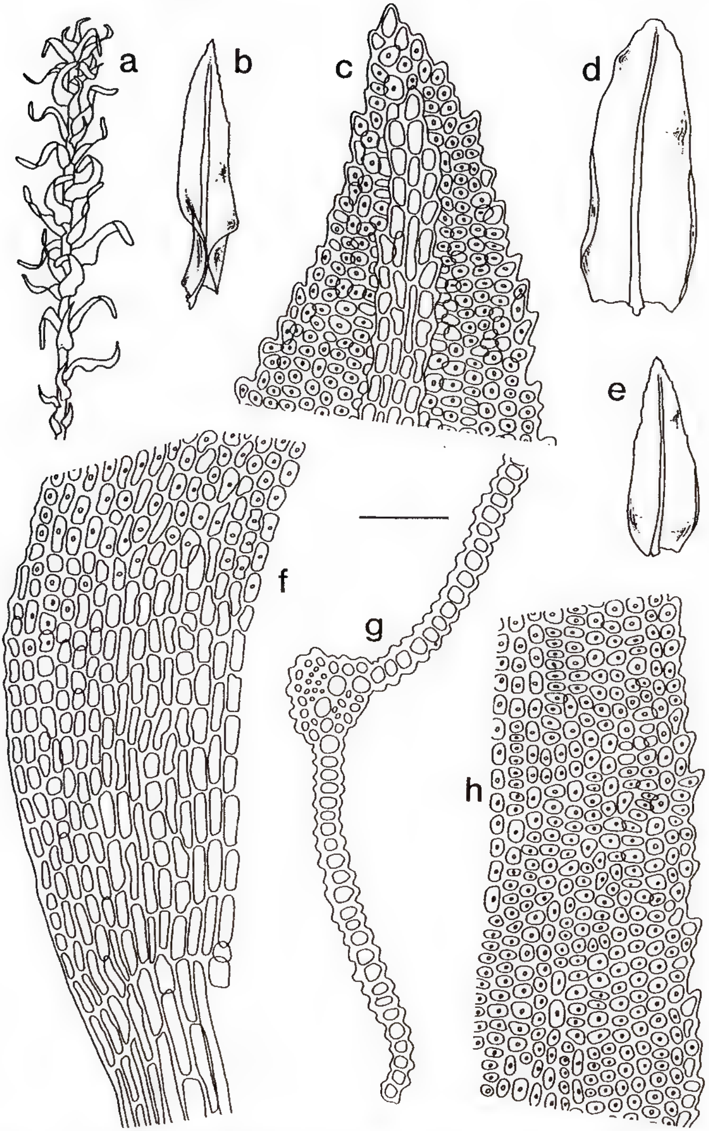

Figure 2. *Dichodontium pellucidum*. a. Habit. b., d. & e. Leaves. c. Leaf apex. f. Basal leaf cells at margin. g. Leaf in cross-section. h. Median leaf cells at margin. Scales in mm: bar = 0.05 (c,f,g,h); bar = 0.5 (b,d,e); bar = 2.07 (a). Figures a,b,c,e,h from *Allen 14623*; figures d,f,g from *Allen 16361,* (both MO).

x 7.5 µm, alar cells not differentiated; small ovoid to ellipsoidal gemmae on short, branched filaments occasionally present in leaf axils. Dioicous. Sporophytes not seen from Maine. [Setae 6-12 mm long, erect, yellowish, stout; urn of capsule 0.75--1 mm long, suberect to curved and nodding, slightly thickened at the short neck and more or less contracted below the mouth when dry; annulus none; operculum ca 0.8 mm long, stoutly and obliquely rostrate; peristome teeth dark-red, 300--450 µm high, forked about halfway to the base or less, vertically pitted-striolate below, the basal membrane projecting above the mouth. Spores about 14--16 µm spherical, very slightly roughened. Crum & Anderson 1981.]

On thin soil over rocks and boulders (granite or limestone) in and along streams or lakes, moist and dry cliff crevices, and seeping rock-faces. In Maine known from Androscoggin (*Allen 14714* MO), Aroostook (*Allen 16386 MO*), Knox (*Allen 14623* MO), Oxford (*Allen 16736* MO), and Somerset (*Allen 9393* MO) Counties.

*Dichodontium pellucidum* is extremely variable in size and leaf shape, but it can usually be recognized by its often yellowish-green color and its common association with streams and seeps (also found submerged in lakes or streams). The leaves are often widely spaced and erect-incurved when dry. Other features helpful in recognizing it are its stoutly mammillose, subquadrate to oblate upper leaf cells, dentate leaf margins, and smooth, long-rectangular basal cells near the costa. The species often has small, ovoid to ellipsoidal gemmae on short, branched filaments in the upper leaf axils. The stems of this species can be triangular or rounded and the costal cross-section can have 1 or 2 stereid bands. These features appear to be correlated with plant size and leaf shape. Robust plants with broad leaves have triangular stems and two stereid bands, while smaller plants with narrower leaves have rounded stems and only a dorsal stereid band.

When first seen under the microscope *D. pellucidum* is hard to identify, but once known it is one of the simplest. This is because the high, bulging-mammillose leaf cells bring to mind the Pottiaceae rather than the Dicranaceae. There are a number of genera in the Dicranaceae that are characterized by papillose leaf cells, e.g. *Leucoloma* or *Sclerodontium* are entirely pluripapillose while *Cynodontium* and *Dicranoweisia*, have unipapillose species. At the family level peristome form rather than leaf cell ornamentation separates the Pottiaceae from the Dicranaceae.

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